PRICE 50 CENTS

American Machinist

OCTOBER 1, 1951

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

METAL SHOW NUMBER

U. S. AIR FORCE 1951 MACHINABILITY REPORT

air superiority starts here

...where Heald's specialized engineering talent paves the way for faster, better production of aircraft parts

Any job is easier if you *know* how to do it. And when it comes to solving complex production problems — in any field — Heald engineers do know the answers. That's because Heald's staff of more than 200 trained engineers includes skilled specialists in every type of precision finishing.

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AMERICAN MACHINIST, published bi-weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder.

EXECUTIVE, EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 18, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President, Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice President, Director of Advertising; J. E. Blackburn Jr., Vice President, Director of Circulation.

SUBSCRIPTIONS: Address correspondence to American Machinist-Subscription Service, 330 West 42nd Street, New York 18, N. Y. Allow ten days for change of address. Please indicate position and company connection on all subscription orders.

Single copies, 50c. Subscription Rates—United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Pan-American countries, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Entered as second-class matter, August 25, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U.S.A.

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Chips and QUIPS

Processes . . . To signalize the Metal Show in Detroit beginning Oct. 15, our cover shows "low-relief sculptures" of the various metalworking processes in simplified form. Drawn by Theodore Van Gorp of our art staff, it was planned to provide a change of pace from our normal picture covers—to indicate that there's a change of pace inside too. Our usual effort is to balance the editorial content; in this case we've concentrated it on welding, forging, materials, and heat-treating—at least nominally the subjects of major importance at the Show.

Metallurgy to the Rescue . . . T. A. Frischman, chief metallurgist of the Axle Div, Eaton Mfg Co, has put down for us for the first time the principles of metallurgical control to avoid shop problems with materials or heat-treatment. It is a unique kind of Special Report, a handbook of solutions to actual shop problems, a list of defects to watch out for, correct procedures and forms. The whole object is to minimize production losses through setting up proper controls.

Machinability II . . . Curtiss-Wright has just published "U.S. Air Force Machinability Report—1951," the second of the progressive volumes summarizing its development work. We've added an 8-page Special Report with the major chart and data on machinability of 12 steels, plus three Reference Book Sheets on other phases of the work. For earlier data, see *AM*, Oct. 16 and Dec. 11, 1950 . . . Another exclusive news story in this issue is on cored forging of brass, a process accurate to 0.005 in. which saves much material and machining . . . Both stories were rushed into print —less than a month from source to you.

Green Shaping . . . With increasing emphasis on carbides, it has become essential to find faster, cheaper ways to attain desired shapes. Thus carbide makers are providing special sintered shapes to reduce machining, "Method X" has been announced for making openings. Our lead article introduces another idea—that of grinding partly sintered compacts to exact shape. In this state, the carbide is firm, but soft. Parts are very delicate, so holding method is important, but savings are terrific.

Welding . . . We bring you two welding stories, one on Sigma welding of aluminum tank cars by J. S. Frey, gen mgr of Gen American, the other showing how a spotwelder has been made to double as a hot upsetter. Wm. Finney of Wagner Electric tells the latter story. Each is mostly in pictures for your reading ease.

Flame Machining . . . C. Shank, asst gen supt of Dodge Mfg Co, describes a home-made lathe with flame-cutting heads to cut both ends of a conveyor pulley at once. A friction-wheel drive and great versatility feature the unit.

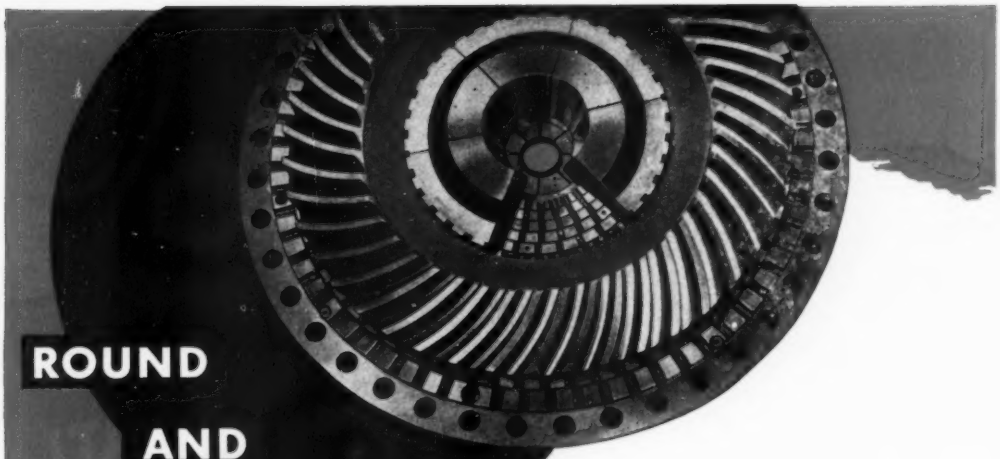
Continuous Batch . . . High-production furnaces are normally rotary-hearth or conveyor units. But in the current situation, with continuous furnaces almost impossible to get, batch furnaces can solve production problems. They take few men, and a breakdown doesn't halt production. George Brailsford, supt of the Douglas Mfg Div, Kingston Products Corp, details his use of batch units for mass and limited output.

Inside-Out . . . A large field-welded tank had to be stress-relieved. It took ingenuity—meaning the relieving was done inside-out. A short story on a useful idea.

Coming . . . Oct. 15 *AM* will include the fourth of Asst Editor Stocker's series of Special Reports on threading, this one dealing with thread inspection. There'll also be articles on executive-training methods at Lockheed, on segmental dies, a sheet-stock "library," horizontal drilling, handling government orders, and several other articles. The Shaw-Smith series on metallurgical considerations in machining will be resumed in that issue also.

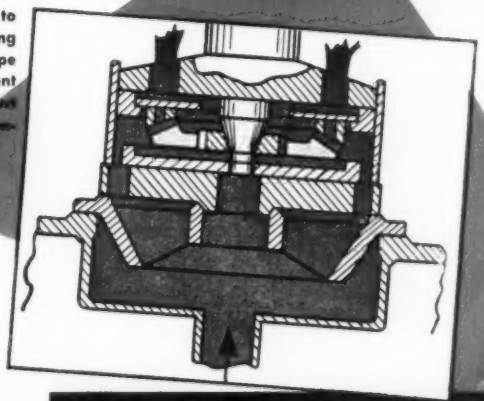
GRINDING SPECIALIST . . . Henry F. Swenson, president, J & S Tool Company, Inc., East Orange N. J., started his shop about 10 years ago to manufacture special-purpose form tools. One of the first problems was the lack of a satisfactory angle-tangent wheel dresser. To meet their own needs, they developed the "fluidmotion" dresser. When a visiting manufacturer saw it operate, he ordered 10 more for his plant. This encouraged J & S to market the unit.

Henry Swenson was born in Sweden, where he served his apprenticeship. After a few years of shop experience, he came to America where he started work as a toolmaker. Evening courses in engineering, plus a correspondence course in tool design, helped to round out his technical background. Three years ago he started a special study of preforming semi-sintered carbides; results are described in his article in this issue.



ROUND AND TRUE *with* DISTORTION-FREE QUENCHING

When hardening of metal parts is required, the first thought is to prevent distortion. Gleason quenching presses hold parts being quenched between dies which maintain the original shape throughout a metallurgically correct oil flow. This die equipment conforms to the actual shape of the part, and does not obstruct free oil flow over and around the part. It maintains true concentric shape of the part during the entire quench.



Timing cycle begins and quenching oil is forced into quenching chamber and around gear. Quantity and time cycle are under positive control during complete quenching cycle.

In the Gleason No. 36 Quenching Press parts up to 36" may be hardened. Among the many advantages which the 36" Press provides are:

- Controlled quenching at faster and safer production
- Simplified set-ups
- Metallurgically correct oil flow
- Safer loading
- Quenching without distortion

Write for literature. Send in prints of parts to be quenched for our recommendations.

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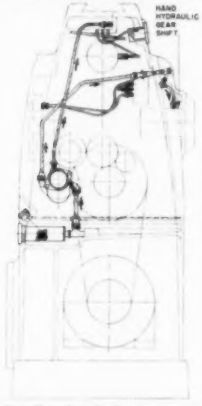
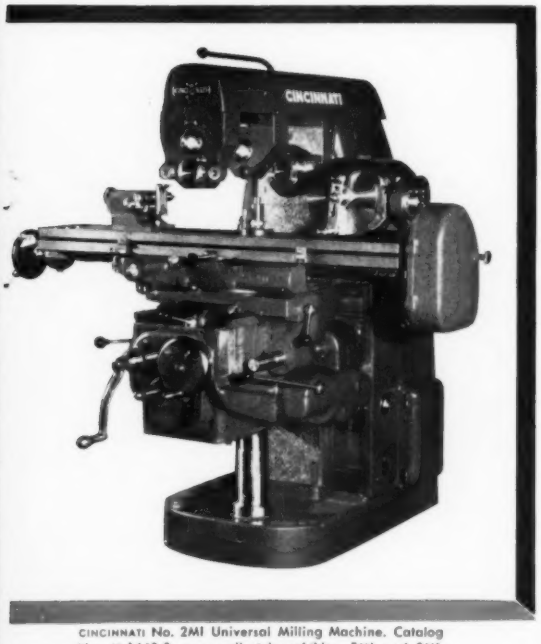
easier to do . . .
CINCINNATI

BECAUSE POWER TAKES THE WORK OUT OF IT



Hydraulic circuit for CINCINNATI Nos. 2ML and 2MI Milling Machines.

Make any job easy to do, and it's more likely to get done. For example, the task of changing spindle speeds on a toolroom milling machine may happen several times for each part. How CINCINNATI Nos. 2ML and 2MI take the work out of changing spindle speeds is illustrated here. The operator merely turns a crank to the right or left, and hydraulic power shifts the gears without clashing. Other ways in which these machines help the operator reduce the cost of milling operations include:



CINCINNATI No. 2MI Universal Milling Machine. Catalog No. M-1662-2 covers all styles of Nos. 2ML and 2MI.

a) Sixteen spindle speeds, 25 to 1500 r.p.m.

b) Sixteen feeds, 120 to 1 ratio, changed at the front of the knee through a single crank type control.

c) Power to suit your requirements; 3 hp for No. 2ML, 5 hp for No. 2MI.

d) Dynapoise overarm, dampens self-excited chatter and allows higher feed rate to be used for many setups.

e) Extra metal on bull-gear, provides flywheel effect so desirable for down-milling operations.

f) Automatic Backlash Eliminator (extra cost) for down-milling operations.

CINCINNATI Nos. 2ML and 2MI Milling Machines are the best you can buy, and they're worth waiting for. Complete information about these efficient and versatile machines may be obtained by writing for catalog No. M-1662-2.

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MILLING MACHINES • CUTTER SHARPENING MACHINES
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OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

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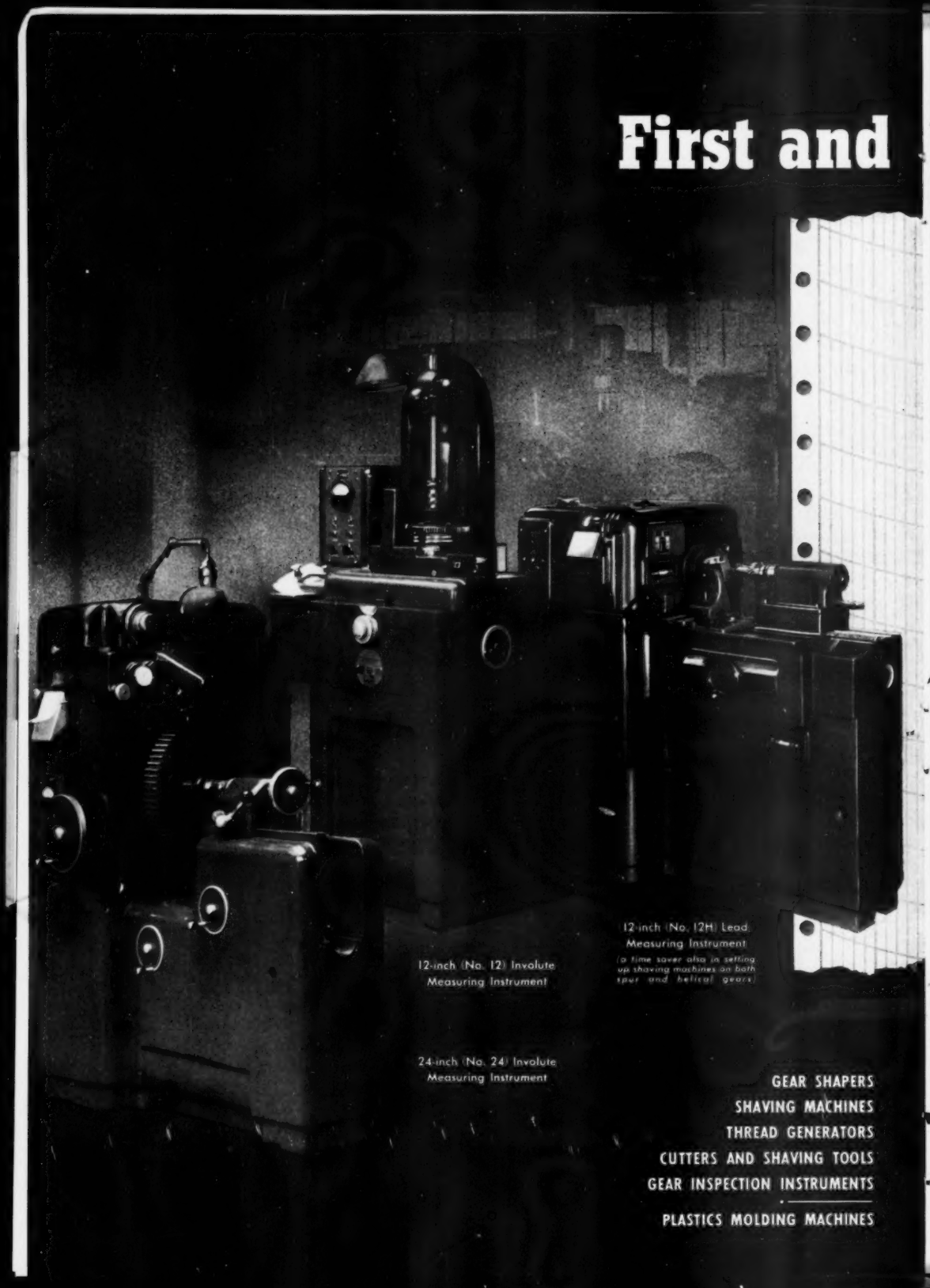

12-inch (No. 12) Involute Measuring Instrument

12-inch (No. 12H) Lead Measuring Instrument
(a time saver also in setting up shaving machines on both spur and helical gears)

24-inch (No. 24) Involute Measuring Instrument

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

Foremost...comes

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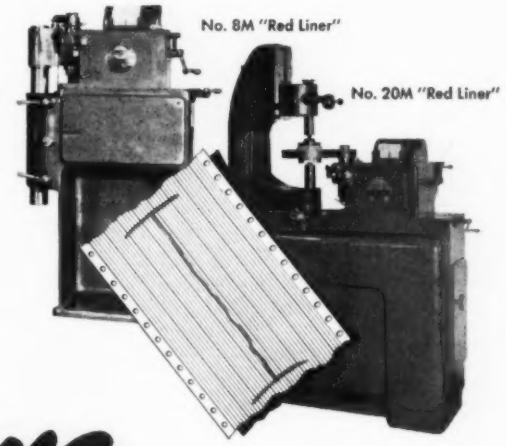

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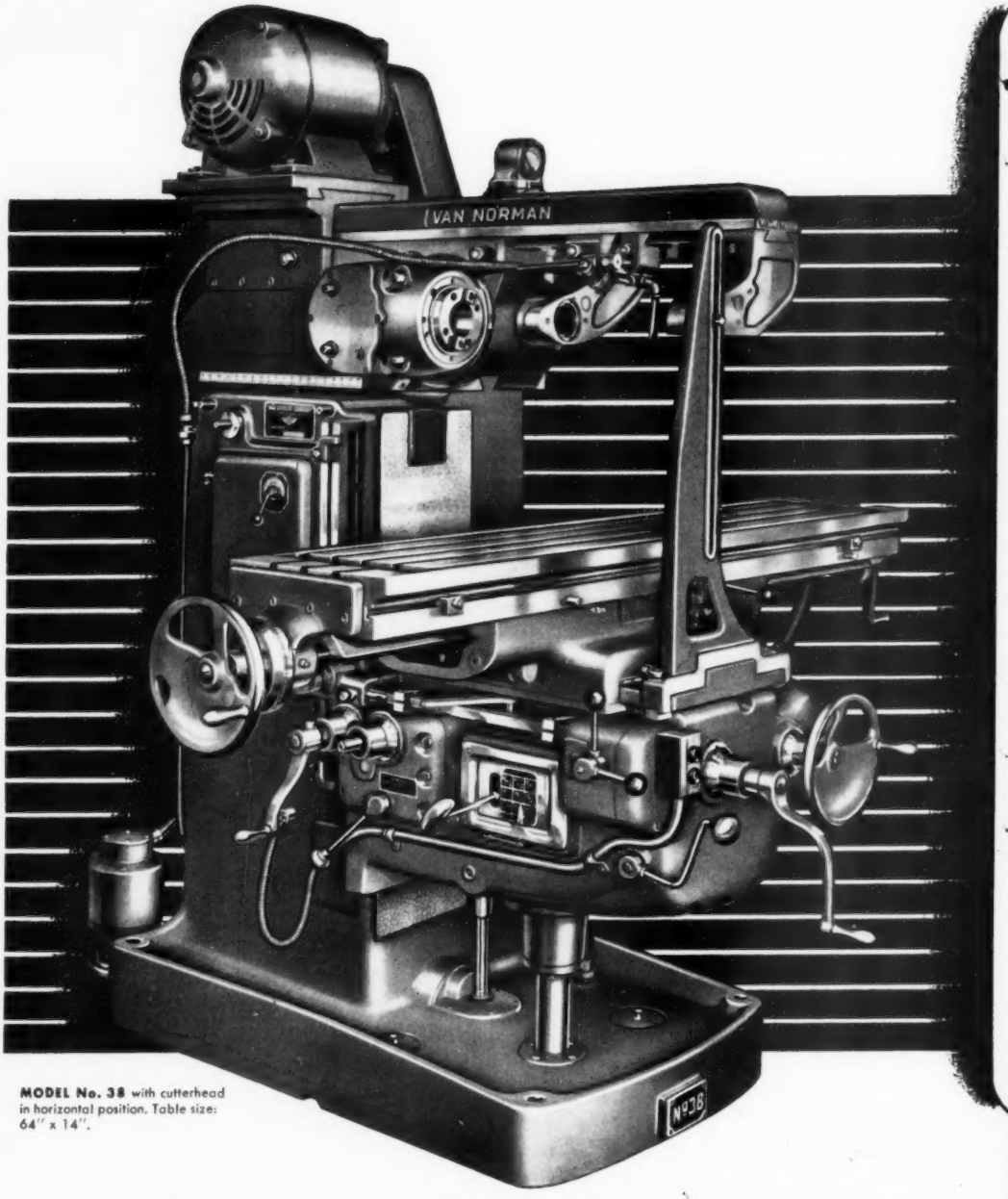


MODEL No. 38 with cutterhead in horizontal position. Table size: 64" x 14".

There's a Van Norman Ram Type Miller for Every Application

You'll Get More Production Hours

with the

VAN NORMAN

No. 38 Ram Type Miller

Operating records in many plants prove that the Van Norman No. 38 Ram Type Miller increases milling production, cuts down idle machine time, and lowers over-all milling costs.

The adjustable cutterhead permits you to perform horizontal, angular or vertical milling on *one* machine. There is no waiting for single purpose machines because practically all operations can be on the ram type miller. All the operator need do is position the cutterhead in the desired position and he is ready to start milling. In addition, work set-ups are reduced to a minimum and the operator gets out more work.

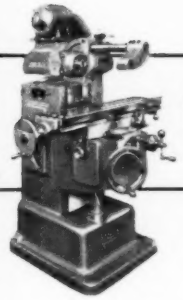
Investigate the Van Norman No. 38 Ram Type Miller for the toolroom, laboratory, pattern and die work, or production milling. Write for complete information.

Compare These Operating Features

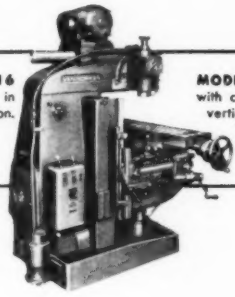
- **WIDE RANGE OF USE**... Adjustable cutterhead has 90° adjustment.
- **SIMPLICITY OF CONTROL** ... All power feed controls are directional — operate in direction of desired table, saddle and knee movement.
- **INCREASED RANGE**... Ram adjustment, in and out over column, provides added work range and capacity.
- **RIGIDITY AND POWER**... Heavy-duty, hardened alloy steel gears with multi-splined shafts; massive streamlined cutterhead and ram; rugged column and knee assembly.
- **LONG LIFE**... Automatic lubrication; anti-friction bearings; larger diameter feed screws.
- **SPEED**... Spindle speeds up to 2000 R.P.M., powered by a 10 h.p. motor, permits every type of milling with all types of cutting tools.

VAN NORMAN COMPANY

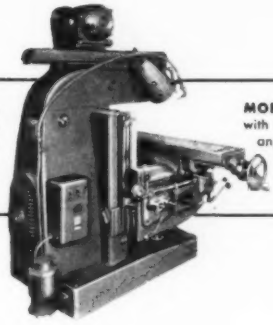
SPRINGFIELD 7, MASSACHUSETTS



MODEL No. 16 with cutterhead in horizontal position. Table size: 37" x 9½".



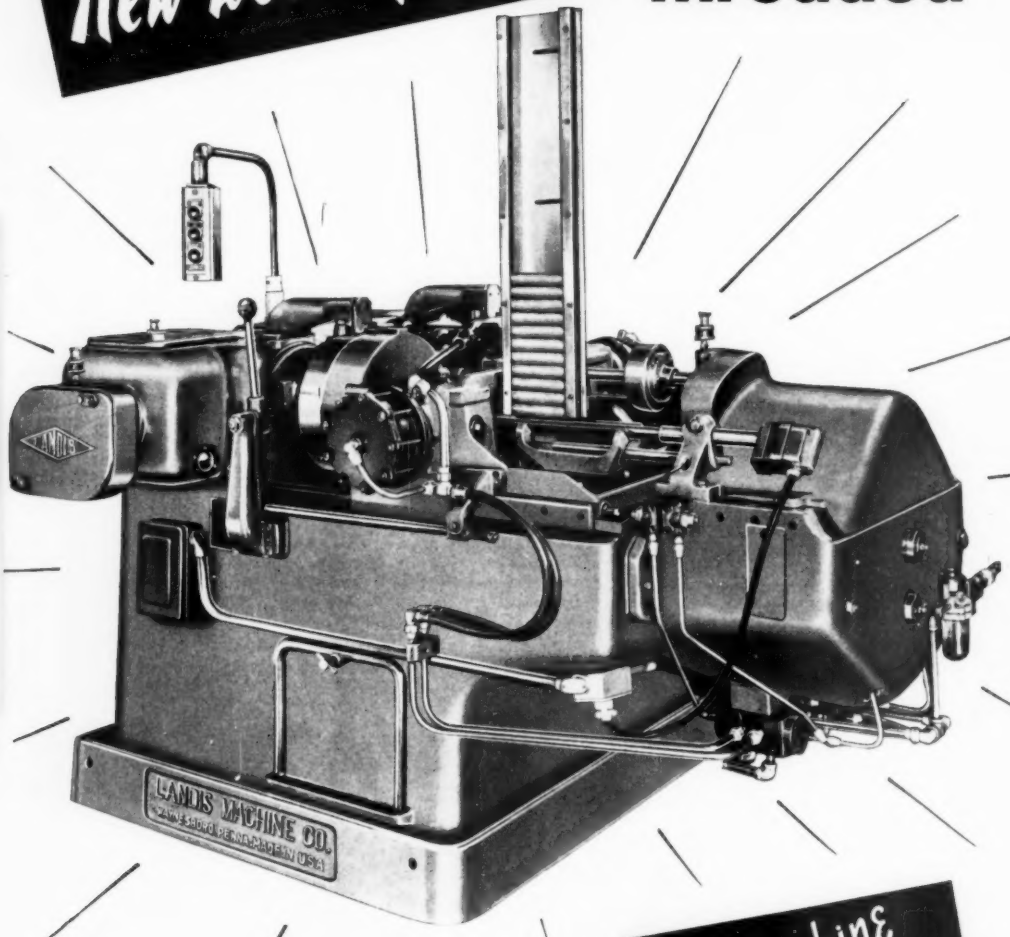
MODEL No. 22L with cutterhead in vertical position. Table size: 45" x 10".



MODEL No. 26 with cutterhead in angular position. Table size: 58" x 13".

Revolutionary New Development

CLOSE *threaded*



THE WORLD'S

LANDIS Machine COMPANY

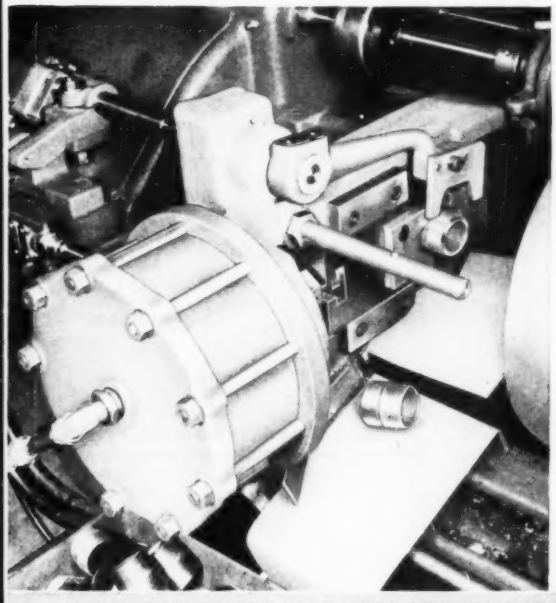
WAYNESBORO • PENNA.

& SHORT NIPPLES

in one automatic operation...

Formerly the production of close and short nipples was featured by high labor cost, low output and tedious manual handling. NOW . . . here is a modern machine tool which mass-produces these nipples in a single continuous automatic operation.

The LANDIS Automatic Close Nipple Threading Machine, recently perfected by Landis Thread Engineers, will produce commercial standard close, short, and special short nipples at rates ranging up to 625 per hour. These machines are built in two size ranges—one for ½" to ¾" nipples—the other for 1" to 2" nipples.



This new LANDIS Close Nipple Machine is completely automatic—threading, reaming, and chamfering close nipples on both ends without secondary manual handling. Nipple blanks are fed from a magazine, transferred automatically from one carriage to the other, and ejected when finished.

Tremendous savings in labor cost can be realized —PLUS other savings through lower tool cost and increased production. The operator is required only to fill the magazine and give supervisory attention. Thus a SINGLE operator can handle TWO or THREE LANDIS Close Nipple Machines, depending on the pipe size.

New construction features contribute to longer life and more efficient operation. Special built-in safety devices guard against damage from jams and ease the supervisory job of the operator. Write today for complete information and specifications.

LANDIS

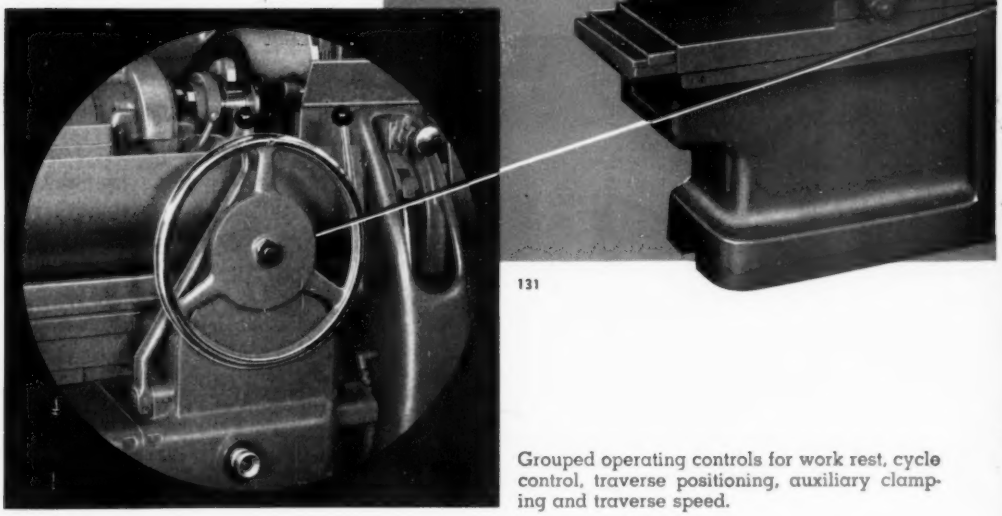
LARGEST EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

NEW LANDIS TOOL

16"-25" Hydraulic Crank Pin Grinder

Simplified Operation Increases Production

- Sensitive Traverse Positioning to Divide Spark when Grinding Sidewalls
- Improved Hydraulic and Electrical Controls
- Telescoping Covers Protect Ways
- Automatic Way Lubrication with Pressure Protection
- Automatic Spindle Bearing Lubrication with Pressure Protection
- Improved Vee Belt Drive for Work Rotation



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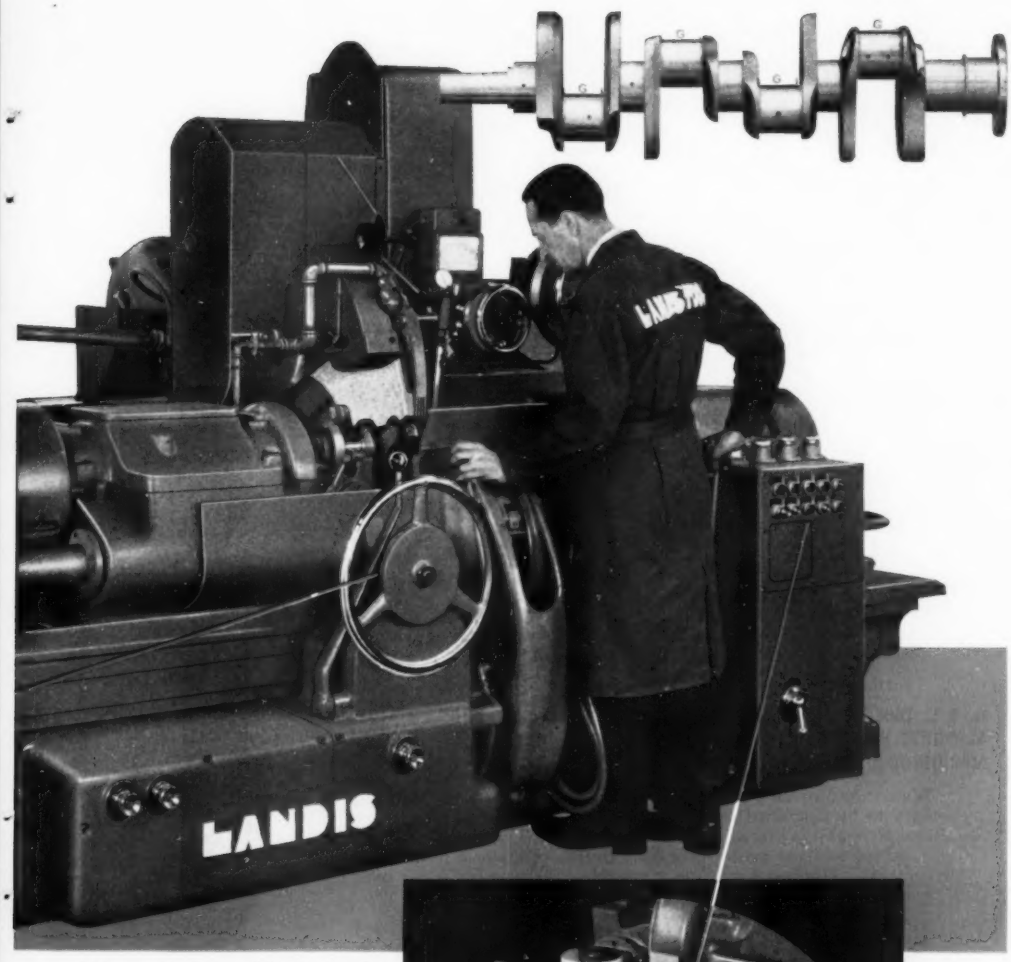
Grouped operating controls for work rest, cycle control, traverse positioning, auxiliary clamping and traverse speed.

LANDIS TOOL

Precision Grinders



16" x 42" Type DH Hydraulic Crank Pin Grinder with optional hydraulically operated overhead wheel dresser.

Infeed control, electrical push buttons and hydraulic controls all grouped for operator's convenience.

Are Your Weldments Hard-to-Handle and Difficult-to-Machine?

If so....

G. & L. MACHINES EASILY SOLVE UNUSUAL PROBLEMS IN PRODUCING FABRICATED PARTS

End concern over the methods to use in machining weldments.

At the same time give design engineers more latitude in simplifying complicated assemblies. You can do both by routing fabricated parts to G. & L. machines!

Two typical jobs illustrate methods of work handling. A large tangent bender frame is easily placed on box parallels and quickly machined, using a floor type G. & L. The frame is milled, bored and counterbored in approximately 14 hours. All milled surfaces are held to .005" in relationship to the completely machined central die mounting surface and the bore shown.

Further, a—

G. & L. TABLE TYPE MACHINE WITH EXTENDED SADDLE AND SUPPORTS RIGIDLY HOLDS CRANE TRUCK FRAME DURING MACHINING OPERATIONS

Were it not for the open structure of this G. & L., the frame would have to be machined in sections and later assembled. Here the complete unit is placed on the machine table. The bearing surface is milled and the center post hole bored. Dimensions are held to .001". Floor-to-floor time to complete the part is slightly over 8 hours.

A countless number of weldments are being profitably machined on G. & L. equipment. You can share in similar profits by asking G. & L. engineers how to machine your fabricated parts.

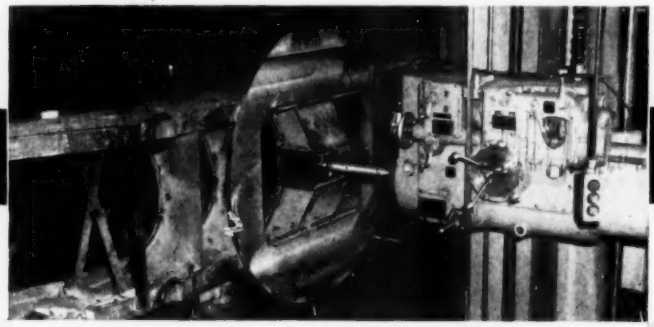


Photo Courtesy Bay City Shovel Co., Bay City, Mich.

Ample supports to the machine table permits extra long fabricated parts to overhang, simplifying both setup and machining.

G&L HYPRO DAVIS

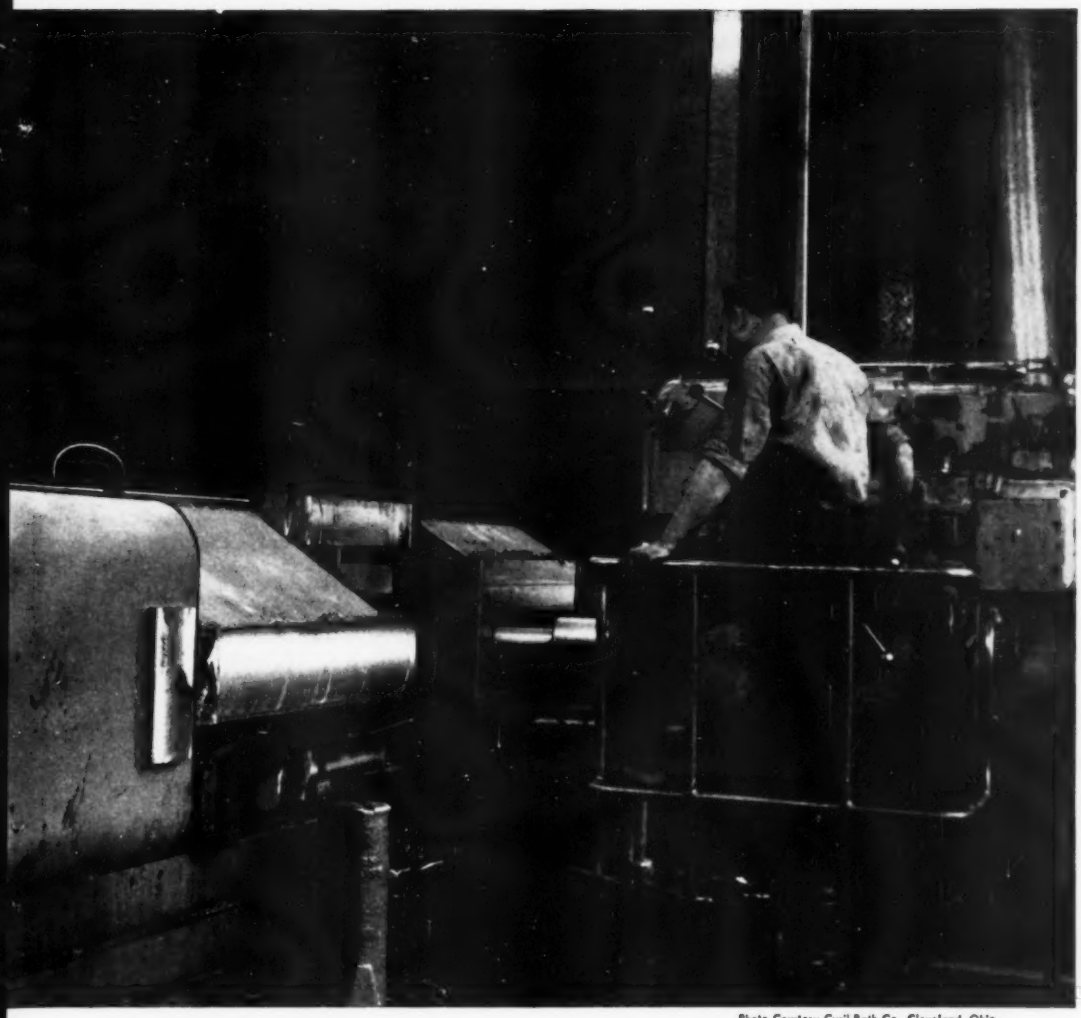


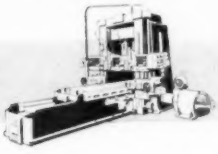
Photo Courtesy Cyril Bath Co., Cleveland, Ohio

Ease of handling weldments is typified by this large tangent bender frame.

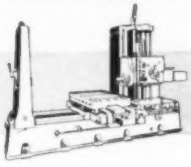
GIDDINGS & LEWIS MACHINE TOOL COMPANY

FOND DU LAC, WISCONSIN, U.S.A.

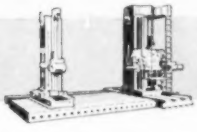
G. & L. HYPRO
Double Housing Planer



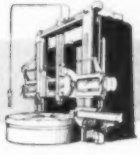
G. & L. Table Type
Horizontal Boring Machine

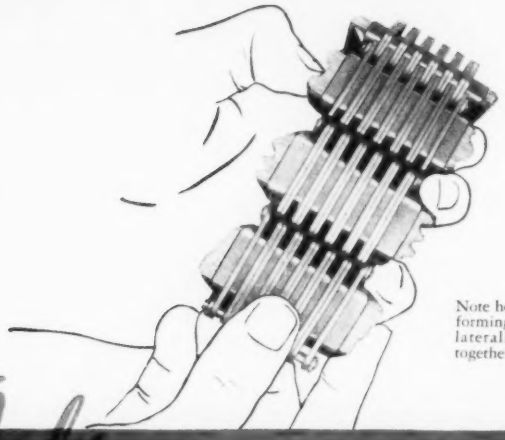


G. & L. Floor Type
Horizontal Boring Machine



G. & L. HYPRO Vertical
Boring and Turning Mill





Note how slats in the self-tooth-forming chain are free to move laterally — either singly or together.

Only **the P.I.V. variable speed drive uses**

SELF-TOOTH-FORMING CHAIN

to give you positive, stepless speed changing

The operation of Link-Belt's P.I.V. Variable Speed Drive is not dependent upon friction for power transmission.

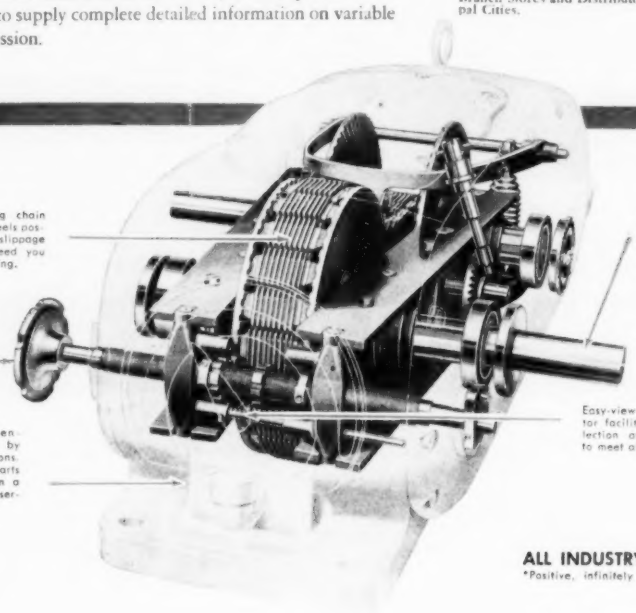
That's because only Link-Belt's P.I.V has the self-tooth-forming chain that allows *positive,* stepless speed adjustment.

If you've been looking for exact speed changing that will deliver full rated horsepower to your machines, it will pay you to call your nearest Link-Belt branch office, as our representatives are equipped to supply complete detailed information on variable speed transmission.

P.I.V. LINK-BELT VARIABLE SPEED DRIVE

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in Principal Cities.

12,272



Self-tooth-forming chain grips toothed wheels positively without slippage — gives the speed you need at any setting.

You can get minute speed changes and maintain them accurately while operating under full load.

An infinite number of positive, stepless speed adjustments may be made with manual, electric, pneumatic or hydraulic controls.

All-metal, totally enclosed — unaffected by atmospheric conditions. All vital operating parts splash-lubricated from a common housing reservoir.

Easy-view speed indicator facilitates speed selection and adjustments to meet all requirements.

ALL INDUSTRY USES P.I.V.*

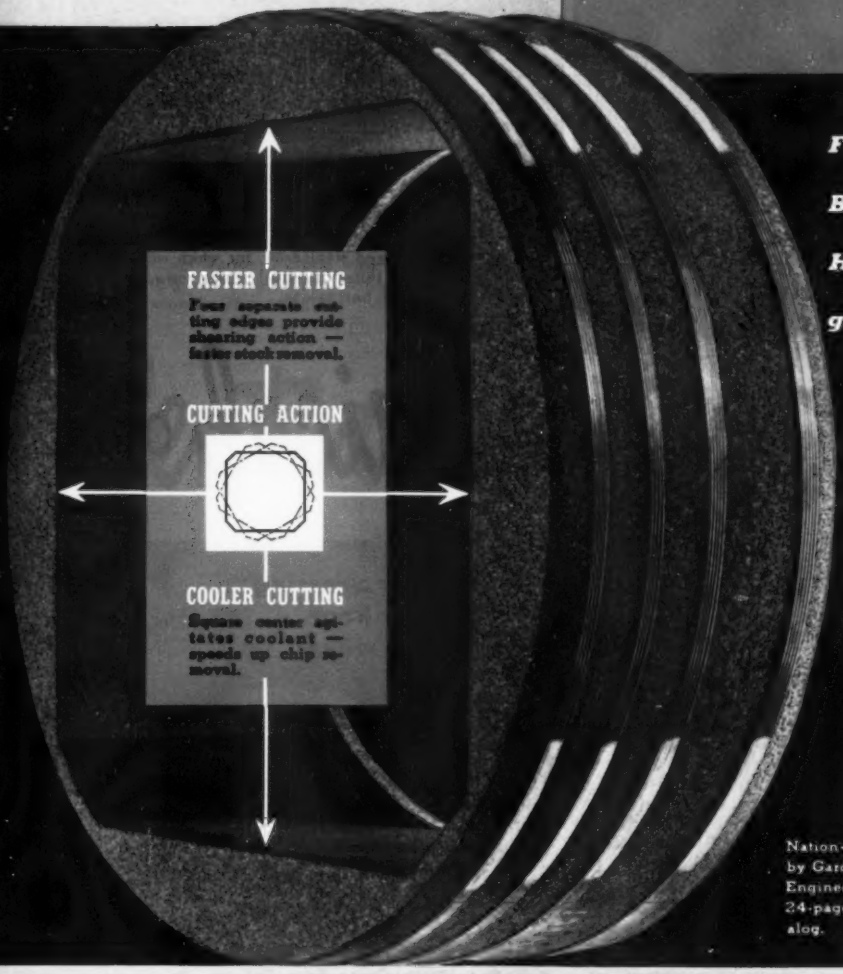
*Positive, infinitely variable

NEW SQUARE CENTER

Brings Flat Surface Grinding Costs Down

GARDNER

abrasive discs


FASTER CUTTING
Four separate cutting edges provide shearing action — faster stock removal.
CUTTING ACTION
COOLER CUTTING
Square center agitates coolant — speeds up chip removal.

For Pratt & Whitney, Blanchard, and Hanchett type grinders

Nation-wide service by Gardner Abrasive Engineers. Request 24-page abrasive catalog.

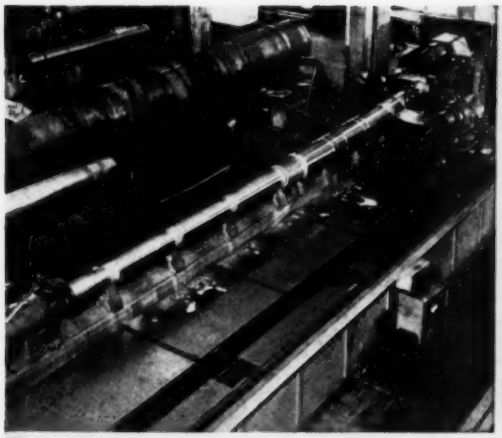
101A

GARDNER WIRE-LOKT ABRASIVE DISCS

full range of types and sizes

GARDNER MACHINE COMPANY

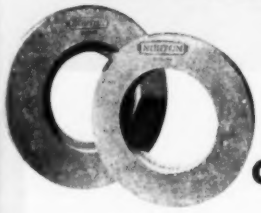
410 Gardner Street • Beloit, Wis.



Grinding an ordnance part on the world's longest cylindrical grinder. On big jobs like this, where spoilage is so costly, the correct Norton wheels assure you the most consistently accurate results.

A plunge-cut grinding job on a centerless grinder, showing use of a hand-operated sliding work rest. Units being ground are high speed steel drills, for which wheels of Norton ALUNDUM* (fused alumina), in the correct grain size and grade, give best results.

In Your Cylindrical or



It's easier to GET MORE UNITS { per dressing / per hour / per wheel

WITH NORTON O. D. GRINDING WHEELS

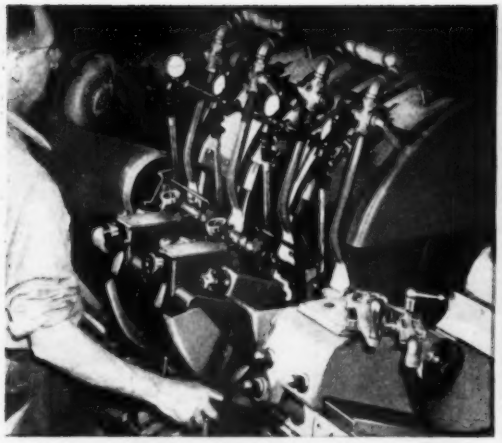
You want your cylindrical or centerless grinding wheels to produce exactly the required tolerances and finish . . . in piece after piece . . . hour after hour . . . with a minimum of dressing or replacement.

With Norton wheels it's *easier* to get these results. Here are the reasons:

1. Norton Range of Specifications Covers All Your O. D. Jobs. Whatever your material or job specifications — in the *complete* line of Norton wheels for O.D. grinding you're sure to find the *one* wheel with the *right* combination of abrasive grain type and bond for top cutting performance and extra long wheel life — and Norton uniformity assures this top performance in *every* wheel.

2. Norton Applicational Aid Covers Your Grinding Problems. In practically every case your Norton Distributor can quickly tell you which types of wheels you need. Backing him is the Norton Abrasive Engineer in your area. And behind both is the Norton technical staff, representing the resources and know-how of the world's largest manufacturer of abrasives.

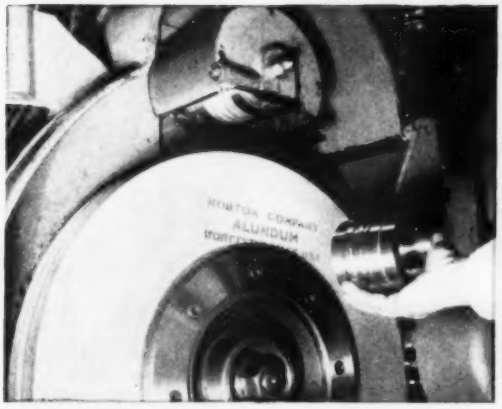
3. Norton Stocks Cover Your Delivery Requirements. Your Norton Distributor keeps ample stocks of popular O.D. wheel types and sizes. Larger stocks are maintained in Norton warehouses in key cities throughout the country, and you can always count on prompt shipments from Norton Company's complete stocks in Worcester.



Cylindrical grinding of four diameters at once. Here, close uniformity of wheels is vital — another good reason for choosing Norton grinding wheels with their proved ability to grind multiple diameters to exactly uniform size with a minimum of dressing.

Through-feed grinding of hollow tubing in a centerless machine. Norton wheels are your best bets for peak production and quality in O.D. grinding — on every type of material, from softest aluminum to hardest steel.

Centerless Grinding...



Shaping a wheel by crush truing, with hardened steel crusher roll shown in raised position. Both Norton ALUNDUM* and CRYSTOLON* wheels can be crush trued, to give excellent results in this rapidly growing method of grinding intricate O.D. contours.

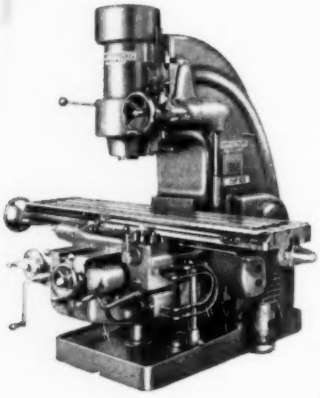
This handy, illustrated booklet gives you the essential facts of cylindrical and centerless grinding, answering many questions and providing convenient selection charts. Ask your Norton Distributor for *The A.B.C. of O.D. Grinding*, or write direct for Form 2006. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

Making better products to make other products better

The Addition of Vertical Style Milling Machines to the New KEARNEY & TRECKER MILWAUKEE CK Line

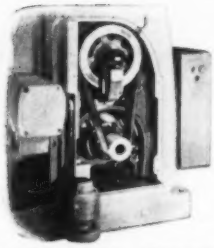


Kearney & Trecker's new CK line of Knee-Type Milling Machines is complete with Plain, Universal and now Vertical styles. These new Vertical CK's have every feature of the CK line. Features that are job and test-proven — designed to fill today's immediate needs — and to meet your tomorrow's milling requirements. You'll find they have all the new CK cost-cutting advantages — Greater Rigidity, Greater Horsepower, Greater Cutting Efficiency, Greater Productivity, Greater Versatility, Smoother Feed Performance and Greater Machine Life. If you need a new vertical style knee-type mill — don't fail to investigate these new CK's. They're the finest Kearney & Trecker has ever offered in a knee-type vertical machine. Five sizes — 10hp No. 2, 15 hp No. 3 and 25 hp Nos. 4, 5 and 6.

Replacement of obsolete machine tools is an

GREATER RIGIDITY — Yes, these new CK columns are the most rigid milling machine columns we've ever designed! They give you 1000 pounds more metal scientifically distributed in heavier ribbing, box section, sponson construction . . . to effectively absorb vibration from heaviest cutting loads.

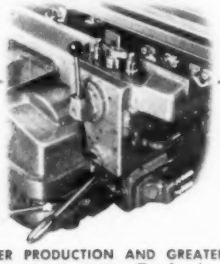
GREATER CUTTING EFFICIENCY — Added momentum of spindle-mounted flywheel assures longer cutter life and greater efficiency, through smoother, more positive drive — a key to most efficient use of modern cutting tools. Spindle rigidly supported by Kearney-& Trecker's original 3-bearing design.



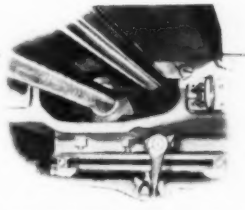
GREATER HORSEPOWER — where you need it. That's what you get with new CK independent motor drives for spindle and for feed and rapid traverse. Depending on machine size (Nos. 2, 3, 4, 5 or 6), machines range from 10 to 25 hp for spindle drive and 3 to 5 hp for feed and rapid traverse.

NON-GLARE RAPID-SET DIALS—You'll avoid costly errors in reading and setting these new micrometer dials. They're vapor blasted to give you a satin surface with high contrast markings. They're easy and quick to set and provide positive lock at every setting.

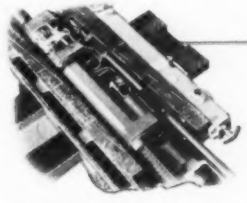
FEEDS AND SPEEDS TO TAKE FULL ADVANTAGE OF MODERN CUTTING TOOLS — and you really can do it with the broad feed and speed ranges on Kearney & Trecker's new CK milling machines. You get 24 spindle speeds (15 to 1500 rpm on Nos. 2 and 3, 13 to 1300 rpm on Nos. 4, 5 and 6) with Kearney & Trecker's automatic protecto-mesh shift to eliminate gear clashing. And there's the extra-wide feed range — 32 changes from ⅜" to 90" per minute—with separate 3 or 5 hp feed and rapid traverse drive.



GREATER PRODUCTION AND GREATER OPERATING CONVENIENCE—Production men will like Mono-Lever Control because it reduces idle cutter time, shortens floor-to-floor cycle time on both long and short run lots. Operators will like it because it makes faster, simpler, less fatiguing work for them.



SMOOTHER FEED PERFORMANCE — with a new design 2" diam. heavy-duty, table feed screw that affords greater bearing contact and runs through an extra-long table feed nut. These new CK machines are equipped with a backlash eliminator for more effective climb milling, more accuracy and longer screw life.



GREATER MACHINE LIFE — through automatic lubrication and generously proportioned gears and shafts throughout for overload conditions. There's a forced flood system in the column and knee, and a positive metered, pressure pump system for table, saddle and knee ways, and table feed assembly.

Kearney & Trecker's new CK Line is designed to meet every demand of present-day milling operations . . . making CK machines more accurate, and MORE PRODUCTIVE for you. Contact your nearest Kearney & Trecker representative or write direct to obtain complete specifications of these fine new machines. See how they easily replace obsolete machines at substantial savings to you. Kearney & Trecker Corp., 6784 West National Avenue, Milwaukee 14, Wisconsin.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

investment that makes both Dollars and Sense.

Warner & Swasey 1-AC Single Spindle Automatic in use at Cloyes Gear Works Inc., Cleveland, Ohio

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH.....

"Most profitable turning investment we have ever made"

● This is the enthusiastic approval given the Warner & Swasey 1-AC Single Spindle Automatic by H. C. Stebbins, President of Cloyes Gear Works Inc. Timing gear specialists to the automotive industry for 30 years, his 50-man shop was faced with the necessity of expanding operations —without costly building construction— in the face of today's tight manpower situation.

The Warner & Swasey 1-AC answered this complex problem. Using the same floor space, production has been doubled on jobs previously done on hand operated machines. And scarce machine operators have been released for other important jobs in the plant.

Charles Laslo, Plant Superintendent, reports that he finds the 1-AC adaptable to more and more jobs. And setup is quick—requiring no more time than was necessary for hand operated machines. In fact, it has been found profitable to set up for as few as 100 pieces—most unusual for an automatic machine. The 1-AC's over-all greater accuracy has improved the finished product, and limits of one-thousandth of an inch on bores have been maintained.

So before you make any additional investments in machine tools—or in additional building construction —first call in your nearest Warner & Swasey Field Engineer. He'll show you how Warner & Swasey Automatics can increase production in your existing floor space, and conserve your manpower.

WARNER & SWASEY TURRET LATHES, AUTOMATICS, AND TAPPING MACHINES

For a Mirror-finish
. . . here's a reflection of

Morse Quality
on every Reaming Job

Yes, here's the kind of finish you get on Morse Reamers and for every reaming job. And that's because these precision Morse Cutting Tools are made to closest tolerances, from top-quality steels . . . to give you 100% performance *on a production basis,* in either hand or machine operations. For even greater production, specify Morse Electrolized Reamers.

A full line of Morse Reamers is available. Just remember, that if you want Morse Quality, then be absolutely sure you are getting genuine Morse Tools. See your Morse-Franchised Distributor . . . and he'll see that your requirements are filled *exactly.*

Morse Twist Drill & Machine Company
NEW BEDFORD, MASS.
(Div. of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, San Francisco

MORSE
Cutting Tools

MOR
MO
MORSE
MORSE

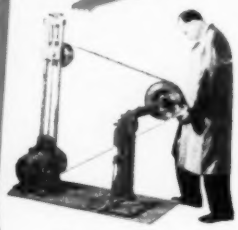
All the latest

New BUSH YOKE SANDER

Manufactured and Sold by
BUSH MANUFACTURING CO.
Clawson, Michigan

You can do almost anything in sanding on this tool — use it either vertically or horizontally, get into small contours (inside diameters, outside diameters), and/ close radius work. Finish inside surfaces and other spots and areas that have always been comparatively costly problems to handle on a volume basis. It might be just what your present production needs. Why not talk it over with a BEHR-MANNING Abrasives Engineer.

New The BADER BELT POLISHER



Manufactured and Sold by
STEPHEN BADER & CO.
Rockville Centre, New York

This versatile machine enables use of a wide range of diameters in contact wheels — from 2" to 18" — permitting the finishing of convex or concave surfaces. The contact wheel is an idler, and as the drive wheel *pulls* the belt past the work, no chatter occurs in even heavy cuts. Wheels as well as belts can be changed in only seconds. Wheels may be of any material giving the desired flexibility and contour — cloth, soft rubber, felt, etc.

Your BEHR-MANNING Abrasives Engineer will give you full details.

BEHR-MANNING

NORTON abrasives

BEHR-MANNING

COATED ABRASIVES · SHARPENING

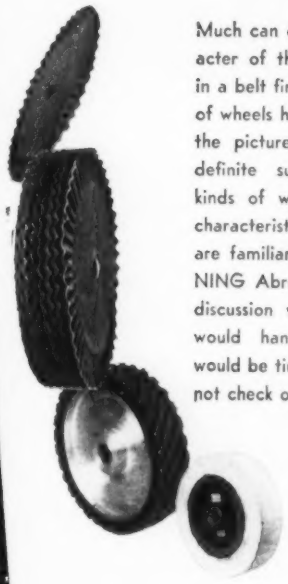
EXPORT: BEHR-MANNING OVERSEAS INC., NEW ROCHELLE, N. Y., U. S. A.

in BELT POLISHING!

New BELT STRAPPING UNIT

This inexpensive arrangement which can be built in your plant requires a flanged motor pulley, and an idler of the spring tension type, with a foot treadle to relieve belt tension and permit the operator to remove the belt from the idler pulley. Thread the belt through the hole to be polished, and replace the belt on the idler. Release the foot treadle. It is not necessary to stop the driving wheel as the belt slips on the flanged pulley when tension is eased. Here is certainly a fast way to finish those hard-to-get-at inside surfaces such as the eyes of shears. The BEHR-MANNING Abrasives Engineer has all needed data.

New RUBBER AND BUFF CONTACT WHEELS



Much can depend upon the character of the contact wheel used in a belt finishing job. New types of wheels have recently come into the picture, each demonstrating definite superiority on certain kinds of work. The details and characteristics of all these wheels are familiar to your BEHR-MANNING Abrasives Engineer, and a discussion with him as to which would handle your work best would be time well invested. Why not check on it?

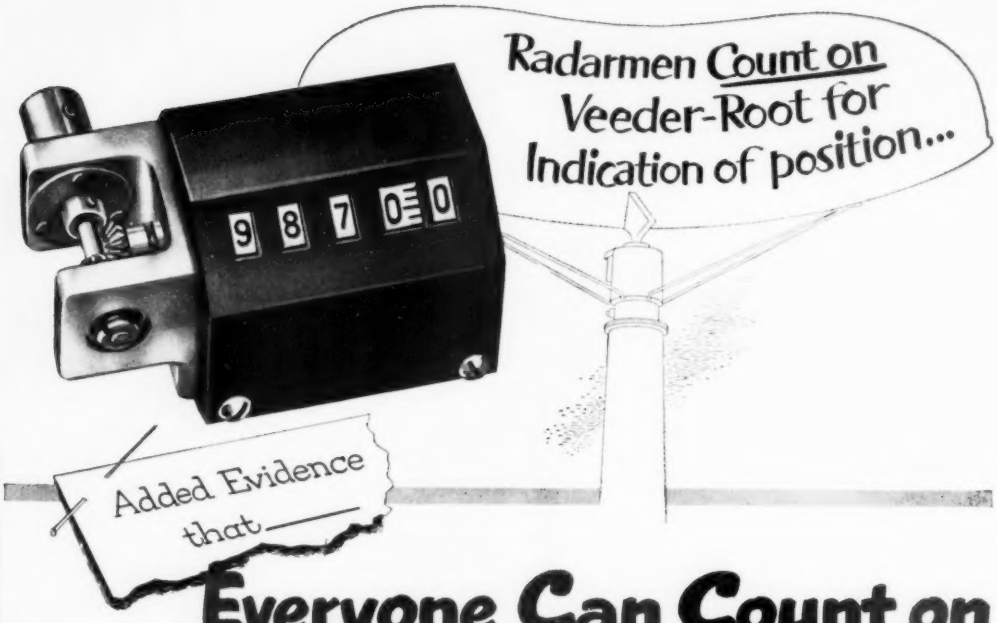
Here's a Packet You Should Have

"Blueprints for Production" covers in detail much that is outlined on these two pages, as well as other new ideas and equipment. Your request brings it — Address Dept. AM-10.

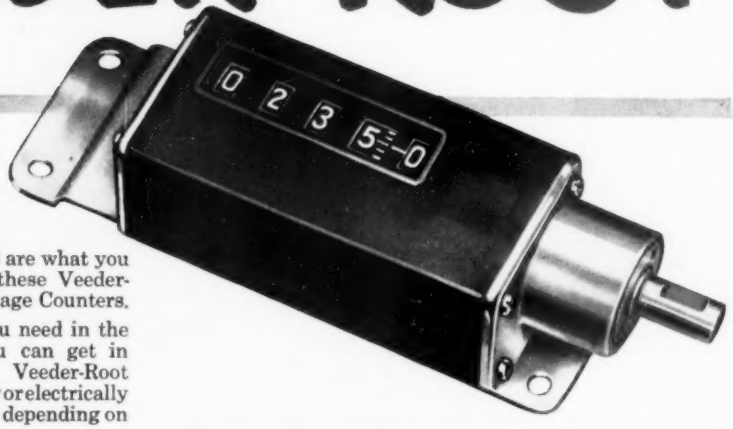
· TROY, N.Y. DIVISION OF NORTON COMPANY

STONES · PRESSURE-SENSITIVE TAPES

CANADA: BEHR-MANNING (CANADA) LTD., BRANTFORD, ONT.



Everyone Can Count on VEEDER-ROOT



LONG-RANGE EYES are what you really have here, in these Veeder-Root High-Speed Yardage Counters.

And anything else you need in the way of *Count*rol, you can get in standard or special Veeder-Root Counters, mechanically or electrically operated . . . deliveries depending on D-O ratings, of course.

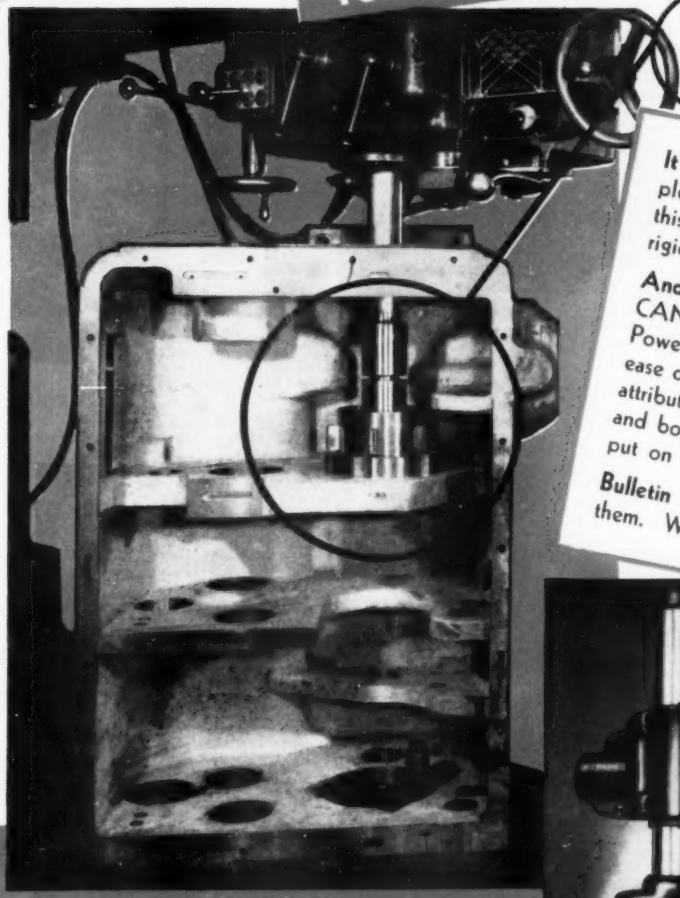
Just get in touch with the world's largest manufacturers of counting and computing devices. . . .

VEEDER-ROOT INCORPORATED
"The Name That Counts"
HARTFORD 2, CONN. • GREENVILLE, S. C.
Montreal, Canada • Dundee, Scotland
Offices and agents in principal cities

VEEDER-ROOT COUNTERS *"Count Everything on Earth"*

A GOOD SPINDLE

FOR GOOD BORING AND TAPPING . . .

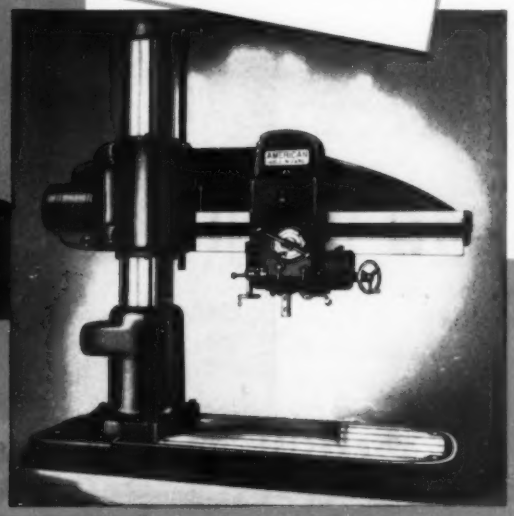


Here's a 10" tapping job on a 5-foot "AMERICAN" Hole Wizard Radial

It takes a sturdy, rigid machine with plenty of power to do work like this. Especially does it require a rigid and smooth-acting spindle.

And that's exactly what "AMERICAN" Hole Wizards are noted for. Power—rigidity—convenience and ease of control are "AMERICAN" attributes that cut drilling, tapping and boring costs wherever they are put on the job.

Bulletin No. 327 tells all about them. Want one?

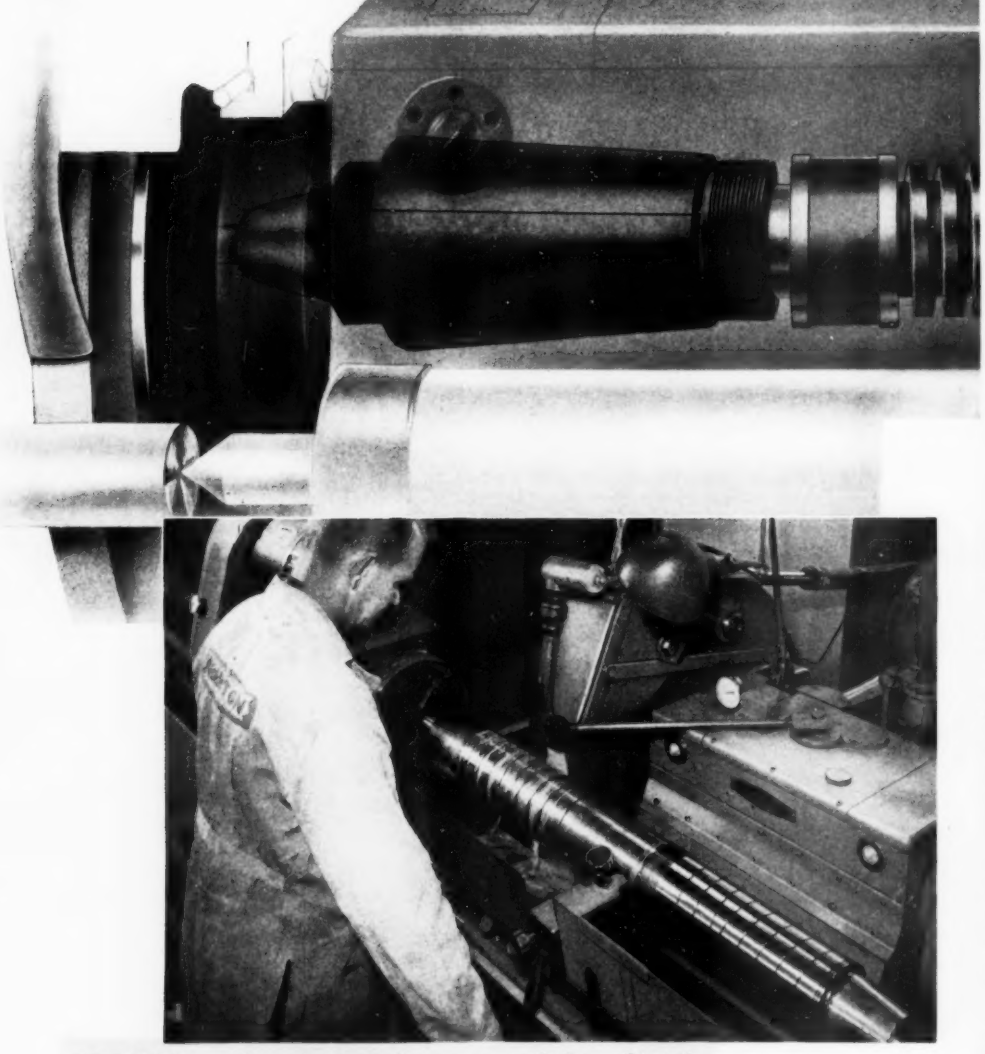


THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

PRECISION FINISHES or HEAVY STOCK REMOVAL . .

The **NORTON**

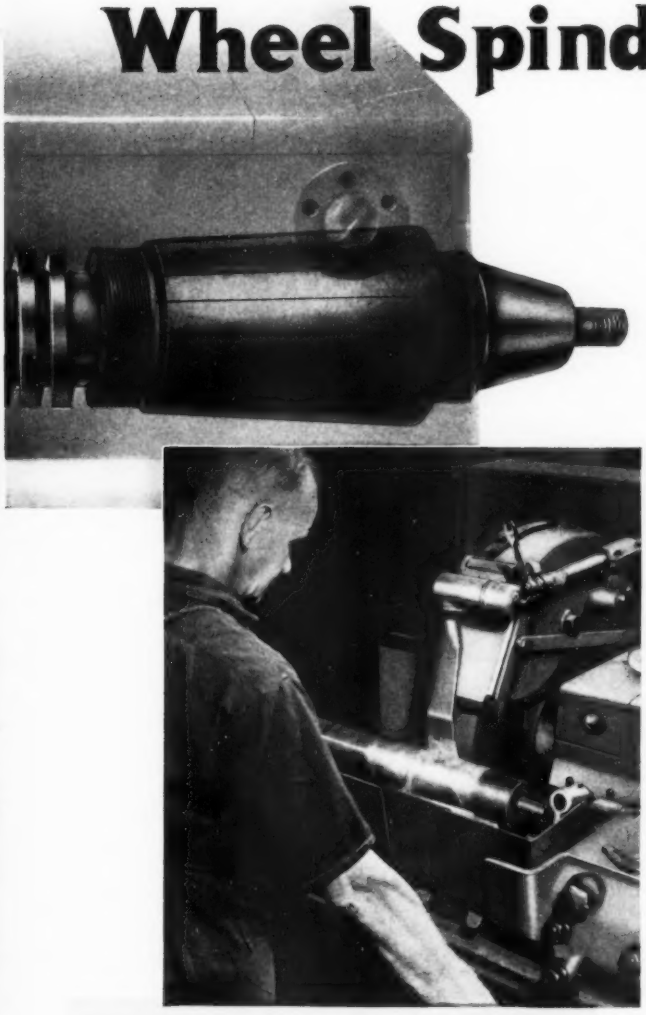


PRECISE . . for close tolerance and fine finish

Making better products to make other products better

. . . YOU GET BOTH with

Wheel Spindle Unit



RUGGED . . for heavy stock removal

FEATURES

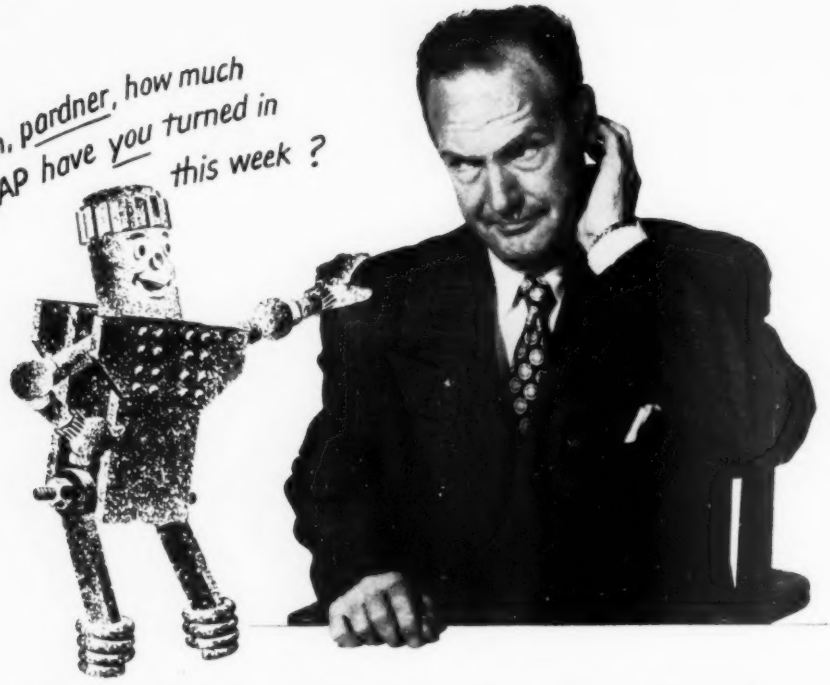
- **Ruggedly proportioned spindle** is of aircraft quality chrome vanadium steel
- **Spindle is specially heat treated** to increase toughness and to produce finest bearing surface
- **Ground helical oil grooves** in spindle move filtered lubricant under pressure but without impulse, between spindle and bearings
- **Precision boring** of spindle bearings assures an exact space between spindle and bearings for lubrication
- **Hard bronze bearings** enclose over 50% of spindle body — affording maximum resistance to wheel pressures and assuring stability of alignment
- **Bearing length** is over twice the diameter — a further assurance of long life and maintenance of alignment
- **End thrust** is taken on two large hardened steel surfaces which are also flood lubricated
- **Automatic flow** of filtered oil always visible to operator through bull's-eye windows on front of wheel slide
- **An unmatched service record**

M602

NORTON
GRINDERS and LAPPERS

NORTON COMPANY, WORCESTER 6, MASS., U. S. A.

District Sales Offices
HARTFORD NEW YORK CLEVELAND CHICAGO DETROIT



Today, the steel business is your business

—*it needs all your SCRAP, Now!*

SUPPOSE that every steel user were suddenly told that he had to turn in a half-ton of scrap before he could get a ton of steel. It would start the most gosh-almighty treasure hunt for scrap that ever happened.

In effect, this "no-scrap, no-steel" situation virtually exists. For without *all* the scrap that industry can search out and start on its way to the mills, steel production will surely drop. It's as serious as that.

More scrap is urgently needed. Today the mills are turning out more steel than ever before. But they're scraping the bottom of the barrel as far as scrap is concerned. Defense and domestic demands for steel simply cannot be met unless at least 100,000 tons of "purchased" scrap roll into the furnaces—*every day*.

The bulk of this scrap must come from industry. That's why we're asking for your all-out help. That's why it's so important that you make the drive for scrap part of your daily operations. Make it your business to encourage every employee to report any obsolete, broken or worn-out machinery, tool or equipment that has seen its day. From this dormant "junk" must come the heavy melting scrap that the mills need most. Don't let your scrap lie idle; send it on its way. How about it, pardner?

You'll find your local scrap dealers listed in the yellow pages of the phone directory.

This page would ordinarily be used to tell you about

U·S·S CARILLOY STEELS

but, because without SCRAP we cannot produce steel, we are asking instead for your all-out help in getting more SCRAP to the mills.

UNITED STATES STEEL COMPANY, PITTSBURGH · COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

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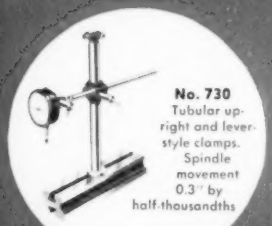
UNITED STATES STEEL

Productivity
...from Brown & Sharpe

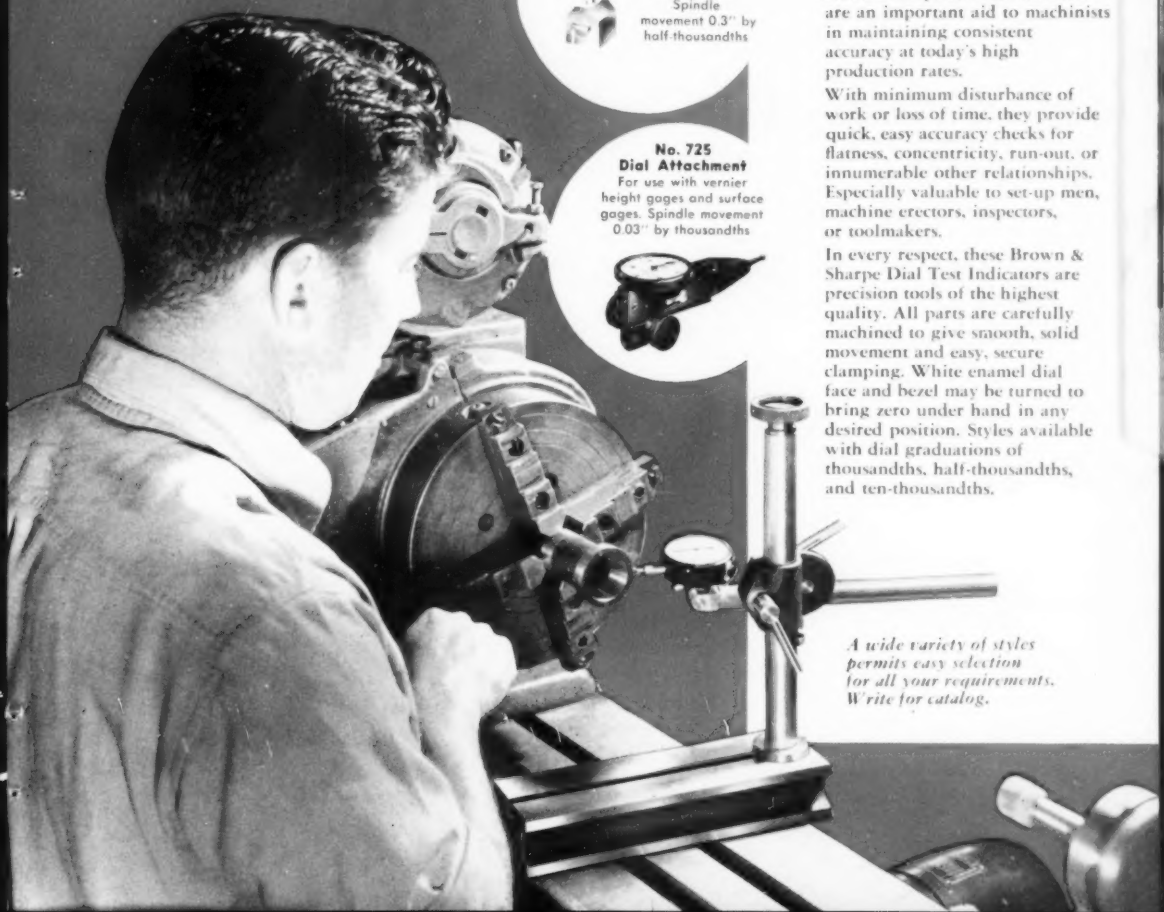


No. 730
Tubular upright and lever-style clamps. Spindle movement 0.3" by half-thousandths

No. 731
Separate clamps for each movement. Spindle movement 0.3" by half-thousandths.

No. 744
With permanent magnet base. Spindle movement 0.3" by half-thousandths

No. 725
Dial Attachment
For use with vernier height gages and surface gages. Spindle movement 0.03" by thousandths



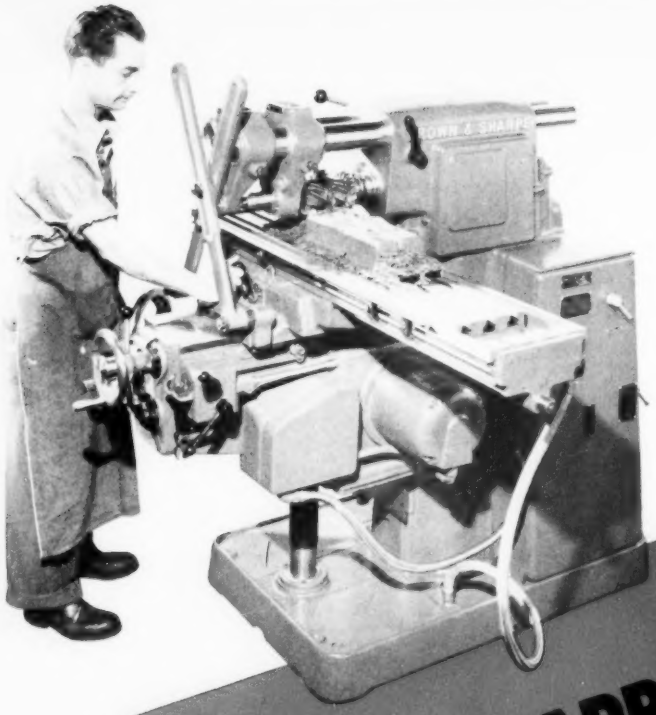
On-The-Job Accuracy Checks that Hold Production High

Brown & Sharpe Dial Test Indicators are an important aid to machinists in maintaining consistent accuracy at today's high production rates.

With minimum disturbance of work or loss of time, they provide quick, easy accuracy checks for flatness, concentricity, run-out, or innumerable other relationships. Especially valuable to set-up men, machine erectors, inspectors, or toolmakers.

In every respect, these Brown & Sharpe Dial Test Indicators are precision tools of the highest quality. All parts are carefully machined to give smooth, solid movement and easy, secure clamping. White enamel dial face and bezel may be turned to bring zero under hand in any desired position. Styles available with dial graduations of thousandths, half-thousandths, and ten-thousandths.

A wide variety of styles permits easy selection for all your requirements. Write for catalog.



TIMELY ADDITIONS FOR A WELL-ROUNDED MILLING DEPARTMENT

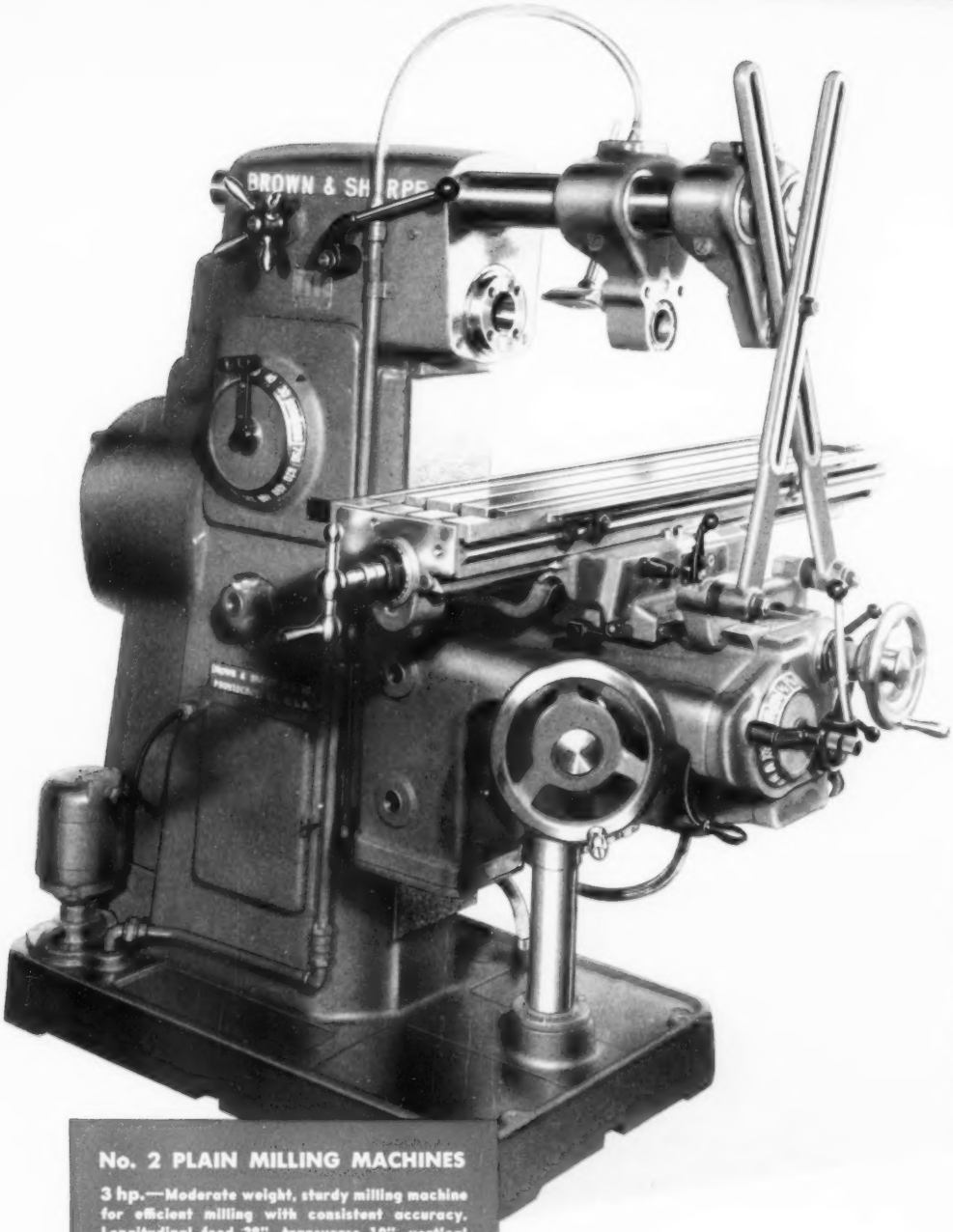
Brown & Sharpe
3 & 5 horsepower
No. 2 Plain Milling Machines

can do the majority of milling work, including much of that now being assigned to other machines

EASY SET-UP AND CONVENIENT CONTROLS on these Brown & Sharpe Plain Milling Machines enable operators to maintain maximum machine productivity at all times. For short run jobs, especially, their flexibility permits exceptional efficiency without the need for jigs and fixtures.

Both 3 and 5 hp. machines are built to the same fundamental advanced design—the principal difference being the power of the spindle motor. Table and coolant drives have separate and independent motors; thereby assuring full power at the cutter, increasing machine flexibility, and eliminating much friction loss.

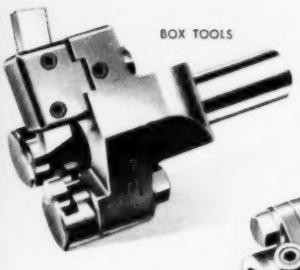
Other important features that help boost production include the extended spindle face, automatic lubrication, fast table travel for all table movements, and quickly selected speed and feed changes. Write for detailed bulletin.



No. 2 PLAIN MILLING MACHINES

3 hp.—Moderate weight, sturdy milling machine for efficient milling with consistent accuracy. Longitudinal feed 28", transverse 10", vertical 15". 18 changes of speed 40 to 1530 rpm. 18 changes of feed from ½" to 20¼" per minute.

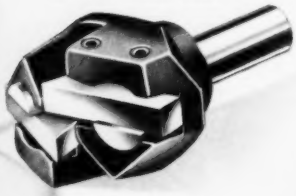
5 hp. (shown above)—Somewhat heavier than the 3 hp., this machine is designed especially for heavy cuts. Longitudinal feed 28", transverse 10", vertical 16½". 18 changes of speed from 30 to 1200 rpm. 18 changes of feed from ½" to 20¼" per minute.

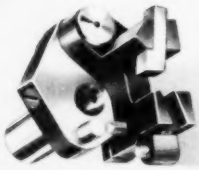


BOX TOOLS

FLOATING HOLDERS

BALANCE TURNING TOOLS





COMBINATION RIGHT AND LEFT-HAND SWING TOOLS

4 "Work-Horse" Tools

that equip your screw machines for most jobs

With today's big demand for screw machine products, 4 basic types of Brown & Sharpe Tools equip you to handle the majority of jobs with maximum efficiency.

Brown & Sharpe Box Tools, Balance Turning Tools, Floating Holders and Combination Swing Tools are specifically engineered for use on the widest variety of jobs . . . and for ruggedness to withstand peak operation.

Now's the time to make sure your stocks of these 4 tools are adequate for capacity production. The Brown & Sharpe line also includes a complete range of other screw machine tools. Write for catalog.

Simplest short-cut to sustained precision in mass-production runs...

Johansson Gage Blocks

In the production of quality work, Brown & Sharpe Jo-Blocks are a convenient protection against costly rejects resulting from inaccuracies in machines or gages. Regular checking of production measurement standards with Jo-Blocks is your easiest, surest way to get *sustained precision* in continuous production. Today, especially, with new emphasis on increased output all along the line, this simple precaution saves loss of valuable time and materials.

Jo-Blocks are made in three guaranteed accuracy standards: .000008", .000004", and .000002" per inch . . . sold as single blocks or in sets. Write for complete catalog.

WE URGE BUYING THROUGH THE DISTRIBUTOR

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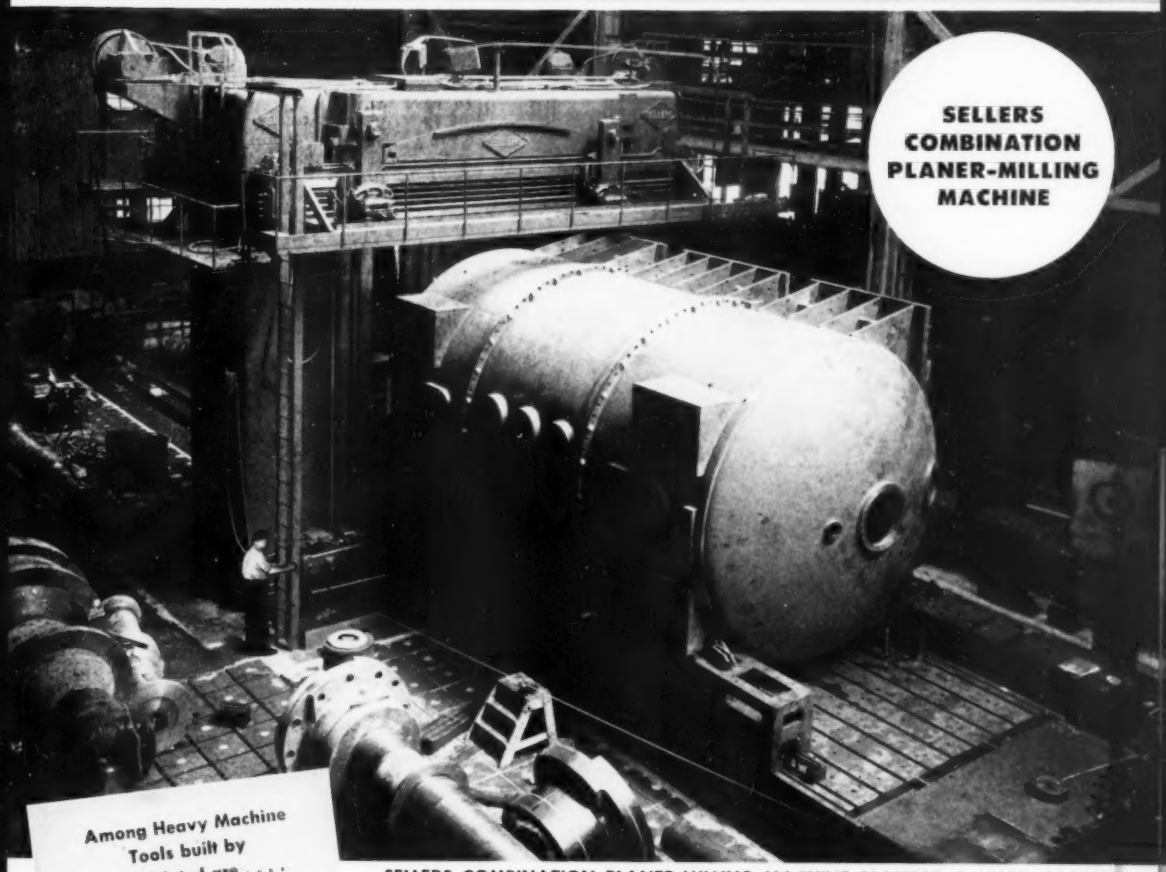
Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U.S.A.

ANOTHER GIANT CONSOLIDATED SPECIAL MACHINE FOR UNUSUALLY LARGE WORK



SELLERS COMBINATION PLANER-MILLING MACHINE PLANING A HUGH CASING

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
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- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS
- AND OTHER SPECIAL MACHINES

The Sellers Combination Planer-Milling Machine is used in the production of equipment for industrial and power generating applications such as, synchronous condensors, hydraulic turbine-driven generators and large motors and generators for steel mills and similar installations. Two machines in one . . . a planer and a miller . . . it eliminates the necessity of transfering work from one machine to another when both planing and milling operations are required. This huge machine is over 76 feet long, 27 feet high and weighs more than 645,000 pounds. It has the capacity to machine work 14 feet wide, 16 feet high and 30 feet long. Due to the enormous capacity of the machine, several parts to be machined may be bolted together and handled as a single unit.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

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CONSOLIDATED
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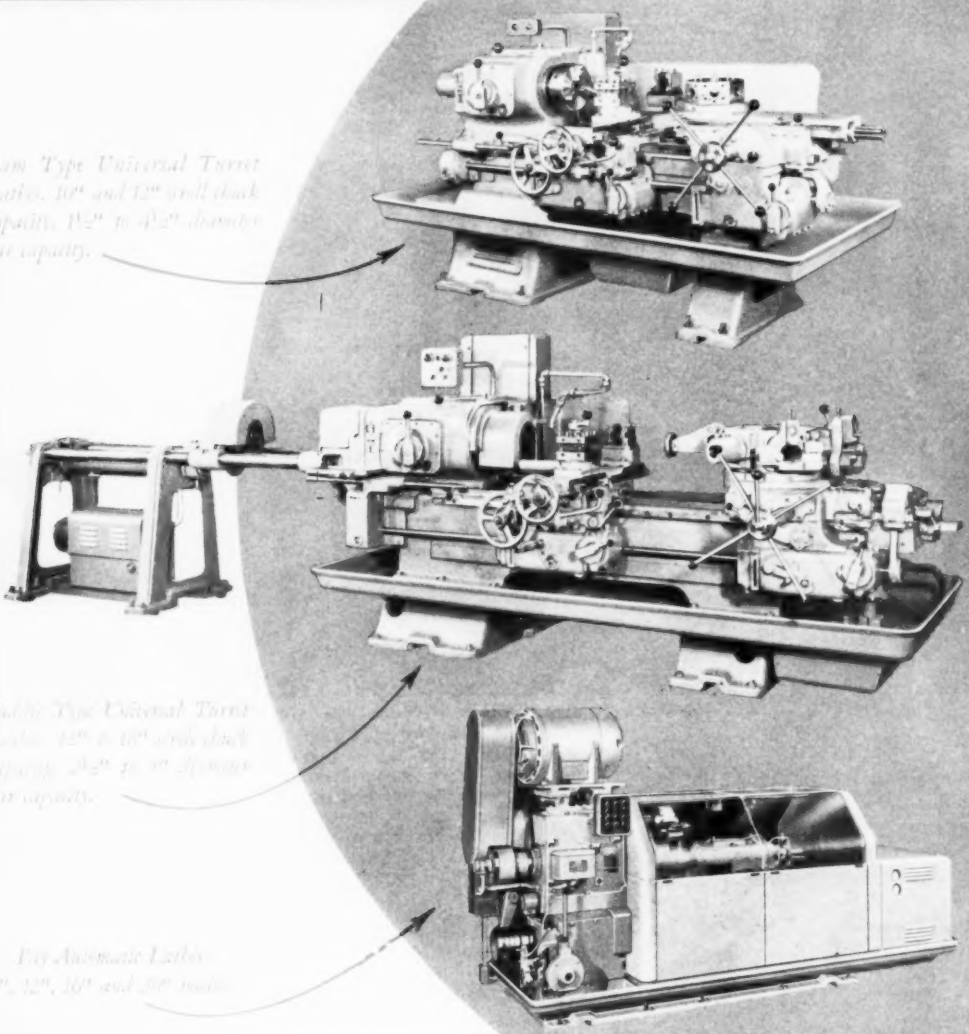
ROCHESTER 10, NEW YORK

JONES & LAMSON PRODUCTS

Designed and Built for Maximum Results

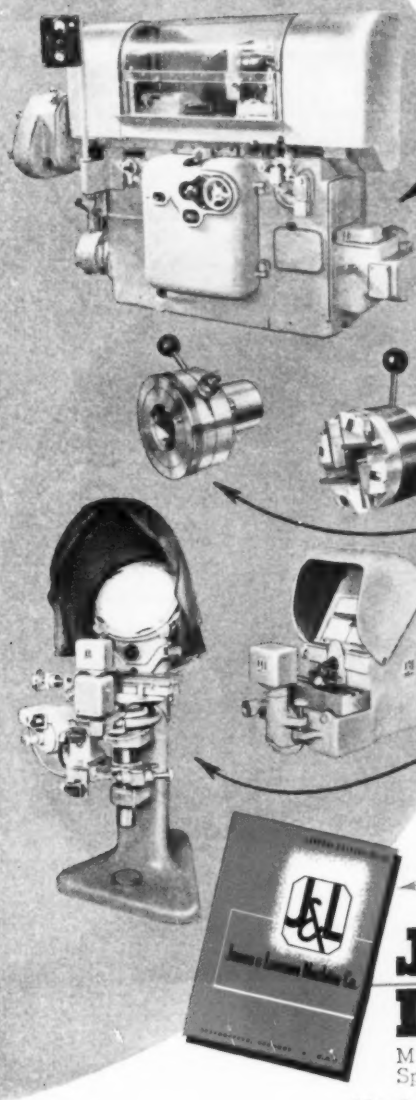


Ram Type Universal Turret Lathes, 10" and 12" swell chuck capacity, 1⅝" to 4½" diameter bar capacity.

Saddle Type Universal Turret Lathes, 12" & 18" swell chuck capacity, 2⅛" to 3" diameter bar capacity.

Fay Automatic Lathes 6", 12", 16" and 20" models.

Ask the J&L expert in your neighborhood to explain the cost-reducing developments in new J&L equipment — also, how you can obtain even better results from your PRESENT J&L equipment



Automatic Thread and Form Grinders For Toolroom or Production Line

Automatic Opening Die Heads, Radial Chaser Types — Capacities No. 8 to 4¾". Tangent Chaser Types — Capacities No. 4 to 2".

Optical Comparators, Pedestal and Bench Models, For Toolroom, Production Line and Laboratory

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WESTINGHOUSE
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Life-Linestarter
PAIRED FOR PRODUCTION
Life-Line motor
DO NOT
LUBRICATE

STOP costly down time with this pair

"Down-time minutes" can mean a loss of hundreds of units or thousands of dollars. Here's a production team—the best defense against down time—Life-Line motors and Life-Linestarters*. They're paired for production.

Advanced design of these two has eliminated common troubles. Look at the features that make it possible:

Life-Line motor

Steel frame... adds strength, cuts weight.

Pre-lubricated bearings... no greasing.

Improved windings... protected by tough Thermoset varnish, add electrical life.

Life-Linestarter

Bimetallic disc... calibration unaffected by aging or oxidation.

Servicing is simple... all parts front removable.

Screw driver only tool required.

Get these two dependable performers—paired for production—and stop costly down time. For complete information, ask your Westinghouse representative for "Life-Line Motor Book", B-3842 and "Tomorrow's Starter Today", B-4677, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21639

YOU CAN BE SURE.. IF IT'S
Westinghouse
Life-Line
MOTORS and CONTROLS

No Problem's

when you call

Better
DIE CASTING
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FIFTY YEARS of better die casting has taught Precision what you need to know to IMPROVE QUALITY . . . REDUCE COST . . . STEP UP PRODUCTION . . . and INCREASE PROFITS.

Through a great half century of fast-paced industrial progress, Precision know-how, ingenuity and determination have contributed a lion's share of improved production methods.

Today when production methods must change almost over night to meet and beat competition, Precision can be of real service to you.

CUT COST AND IMPROVE PRODUCT APPEARANCE

Pictured at right is an example of one of the ways in which Precision has pioneered in the die casting industry. The die maker is holding a die that was made 30 years ago for casting a spur gear. Contrast it with the four and one-half ton modern-day die for casting a complete automotive grille for one of today's cars.

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Call a **PRECISION** *Engineer Today*

too Tough *in* PRECISION!

. . . put your problem to **PRECISION** *and get the answer!*

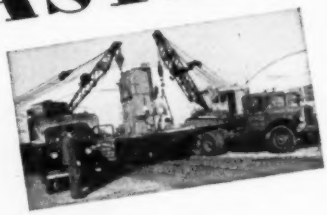
25% Step up Over previous methods

From Vol. 12, No. 2 "Ryan Reporter" published by Ryan Aeronautical Company, Lindbergh Field, San Diego 12, California.

BULLARD

CUT MASTER

The West's tallest lathe speeds work on jet engine parts for Ryan customers



A NEW and - - for this Western region - - unprecedented machine tool has come to Ryan. In the language of production engineers, it is the vertical turret lathe with the highest boring mill with raised bed ever installed on the Pacific Coast.

The new machine is an immense (32 tons; 13 feet high) Bullard Cut Master, called "Hi Boy" in deference to 24 extra inches of height for its bed as compared to the standard vertical Bullard. The loftier bed places the 64-inch diameter turning table in the most advantageous position for accomplishing specialized milling on unusually tall parts. Metal sections measuring from one-half inch to just under 7 feet in height are turned with ease.

Constructed in Bullard's plant at Bridgeport, Conn., the Hi Boy was shipped by rail direct to Ryan on a low-bed flat car that was designed for heavy machine tool transport.

Billie B. Lair, service representative for the West Coast Bullard distributor, and Darwin Whetstine, foreman of Ryan's jet assembly department, estimate

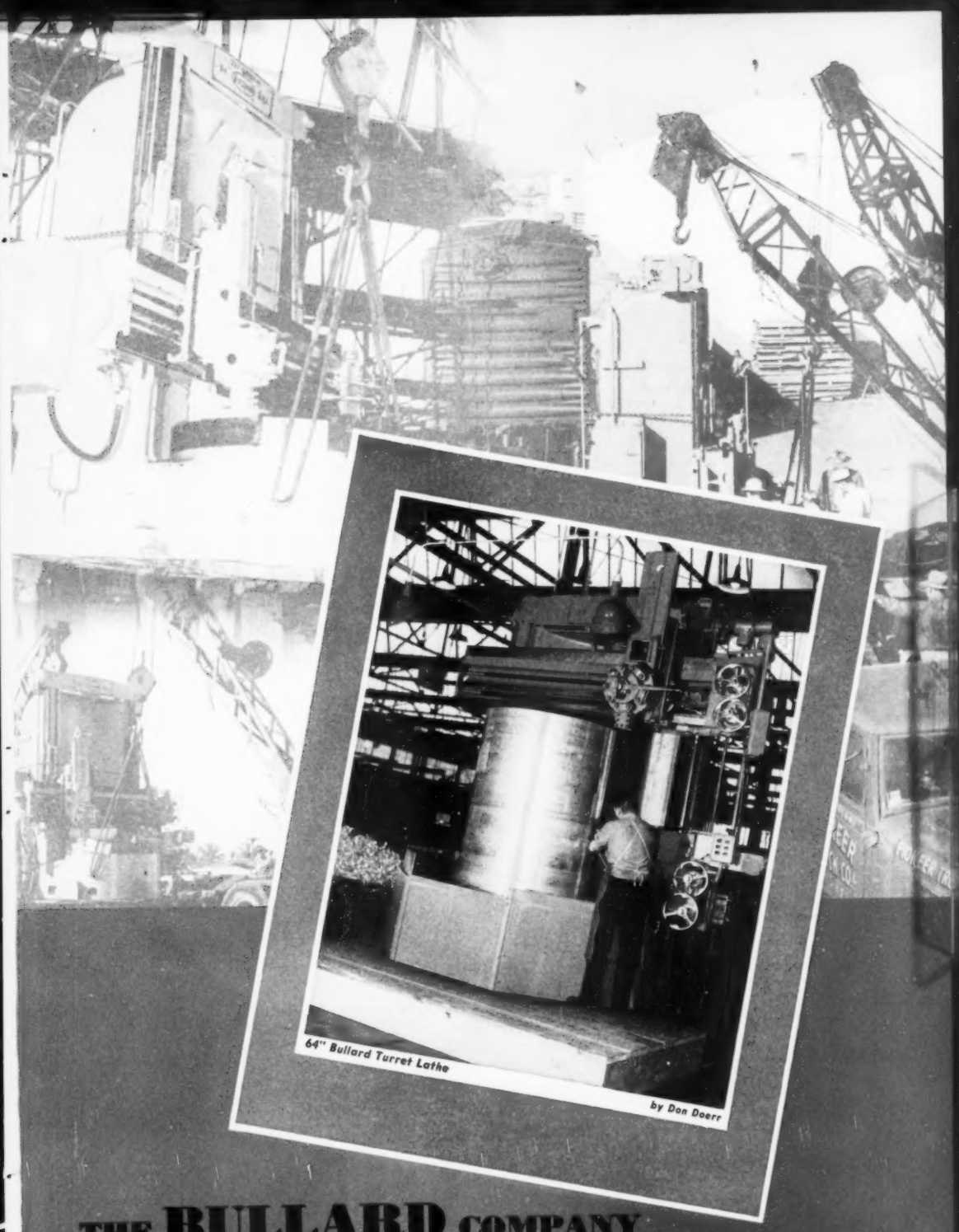
← Part of the main factory building wall was dismantled to permit moving the new Bullard "Hi Boy" into the machine shop.

→ Despite its extreme vertical dimension, an external fuel tank mid-section easily fits the 13-foot high lathe for "turning."

CUT MASTER *continued.*

that, on the basis of first job runs, production on items like the 48-inch aluminum rings for external fuel tanks will be stepped up 25% over previous methods. Similar increased production rates are anticipated on steel cones, aft frames and other jet engine parts.

Emphasizing that a vertical turret lathe is really a conventional turning lathe raised to an upright position, Whetstine adds that he had only to set up a brief training program for his key men to insure skilled operation of the new equipment. Lair also points out that although the Hi Boy is a mighty husky number, its utilization is fatigueless for the operator. One man can run it safely and efficiently, manipulating the lathe's "pendant" (gear control arm) to set off electrical solenoids which in turn hydraulically actuate gear changes to produce desired rotating speeds up to 160 RPM on the fast-whirling table or chuck.



THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

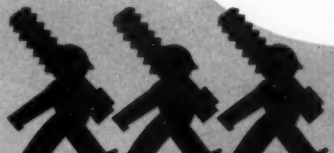
WINTER BALANCED ACTION

HAND TAPS

UNIFORMLY ACCURATE TAPPED HOLES are easily attained when you specify Winter "Balanced Action" Taps. Among other factors, accuracy of spacing and concentricity of chamfers assure this. Infinite care is taken to see that all cutting edges are truly concentric with the axis of the tap, of the same shape, and of equal spacing. The complete Winter line includes chip driver, hand, machine screw, pipe, nut, tapper, and pulley taps. They are stocked by distributors near you and at factory branches in New York, Detroit, Chicago, and San Francisco. WINTER BROTHERS COMPANY, Division of the National Twist Drill and Tool Co., Rochester, Mich., U. S. A.

ALWAYS AT YOUR SERVICE

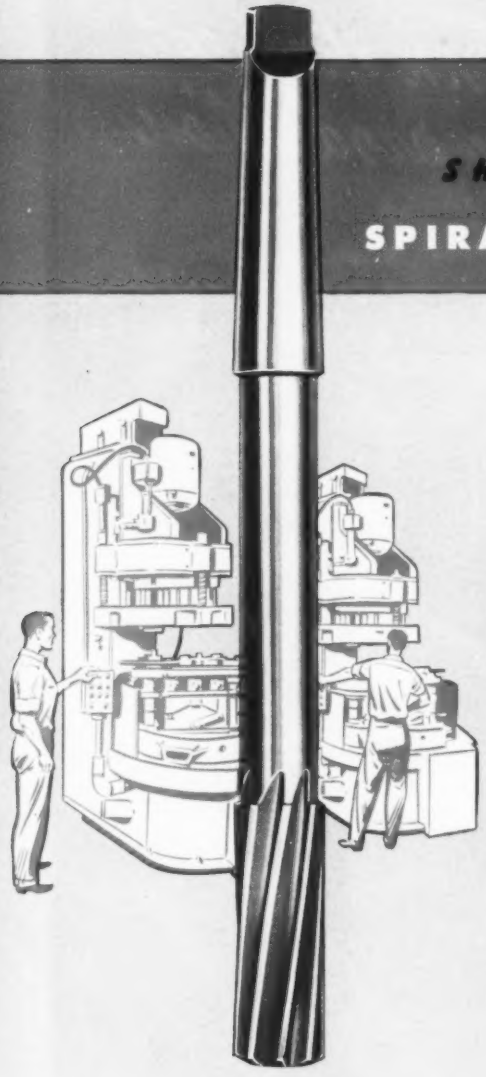
YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.



WINTER BROTHERS COMPANY

WINTER

NATIONAL
SHEARING ACTION
SPIRAL FLUTED REAMERS



REAMING WITHOUT CHATTER

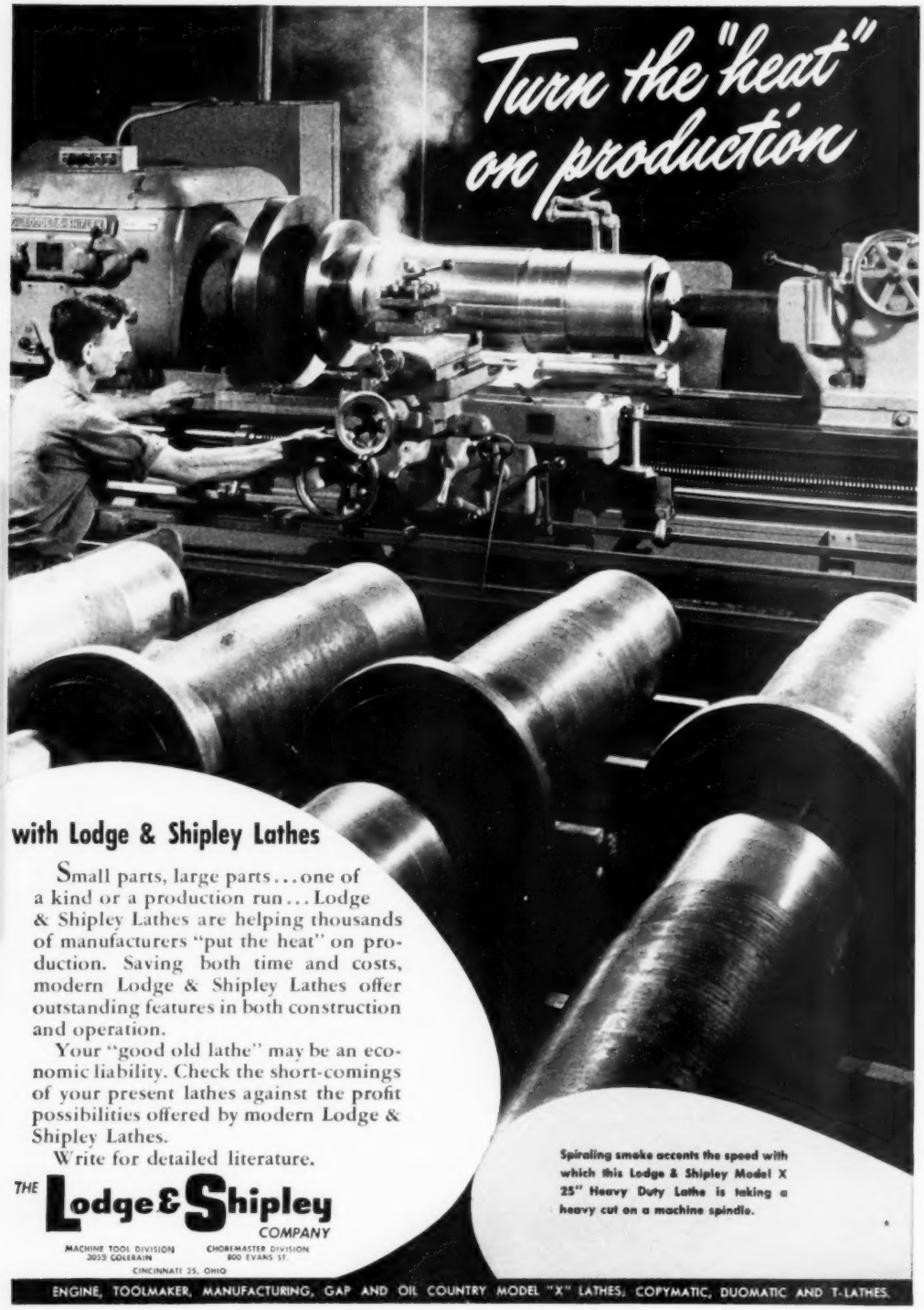
in deep, small diameter holes is easy when you use National "Shearing Action" Spiral Fluted Reamers. As with all reamers bearing the National name, you can be sure of smooth finish and exact tolerances. "Shearing Action" is a plus value you get in National cutting tools. The complete line includes reamers, end mills, twist drills, milling cutters, counterbores, hobs, and special tools. They are stocked conveniently near you at factory branches in New York, Chicago, Detroit, Cleveland, and San Francisco. NATIONAL TWIST DRILL AND TOOL COMPANY, Rochester, Michigan, U. S. A.

"CALL YOUR DISTRIBUTOR"

It is National's firm belief, based on long experience, that the local industrial distributor is the one best source for all staple industrial needs—including NATIONAL Metal Cutting Tools.

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

National



with Lodge & Shipley Lathes

Small parts, large parts... one of a kind or a production run... Lodge & Shipley Lathes are helping thousands of manufacturers "put the heat" on production. Saving both time and costs, modern Lodge & Shipley Lathes offer outstanding features in both construction and operation.

Your "good old lathe" may be an economic liability. Check the short-comings of your present lathes against the profit possibilities offered by modern Lodge & Shipley Lathes.

Write for detailed literature.

THE Lodge & Shipley COMPANY

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3059 COLERAIN
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CHOREMASTER DIVISION
800 EVANS ST.

Spiraling smoke accents the speed with which this Lodge & Shipley Model X 25" Heavy Duty Lathe is taking a heavy cut on a machine spindle.

ENGINE, TOOLMAKER, MANUFACTURING, GAP AND OIL COUNTRY MODEL "X" LATHES, COPYMATIC, DUOMATIC AND T-LATHES.

CLEEREMAN LAYOUT DRILLING MACHINE®

A Modern solution to an Old Problem—

A large portion of tools, dies, jigs, fixtures, molds, jig-less production and other jobs do not require the ultra-precision of a Jig Borer. The Cleereman Layout Drilling Machine has been designed specifically for the efficient handling of this particular work.

Built with many features of design similar to those used in Cleereman Jig Borers, the Layout Drilling Machine is an economical machine capable of accurately locating, drilling, boring, reaming, tapping, etc., with the utmost of operator ease, at a fast rate of production over a long period of time.

Cleereman standards of high quality and proven engineering design and material selection have been maintained in every detail.

WIRE OR WRITE FOR CATALOG WITH COMPLETE SPECIFICATIONS

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CLEEREMAN MACHINE TOOL CO. Green Bay, Wisconsin

BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

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THE HOUGHTON MAN
DEFENSE PRODUCTION DATA
FROM
The HOUGHTON LINE
A factual record of heat treating and metal-working experience in processing SHELLS • CANNON • SMALL ARMS • AMMUNITION • ROCKETS

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HOUGHTON PRODUCTS FOR THE METALWORKING INDUSTRY: Cutting Oils and Bases, Drawing Compounds,

Houghton man's hat there's help for you...

• Getting out into the shop as Houghton men are invited to do, they meet up with a whale of a lot of metalworking problems.

They're continually called on for help in solving problems like these: meeting high physicals in the heat treatment of "lean alloy" steels . . . boosting machine output and reducing rejects . . . developing lubrication that stands up under all operating temperatures . . . cleaning metals faster at lower cost . . . preventing idle equipment from rusting . . . deep drawing safely at extreme pressures . . . and so on.

By working on such a wide variety of problems Houghton has accumulated a lot of metalworking "know-how". We keep careful tabs on success stories through research data and field reports. And all of this information is constantly studied to find out how it can be more widely applied to help the whole metalworking industry.

Because of this vast metalworking experience Houghton men are called on repeatedly for aid—particularly by plants faced with unfamiliar conversion problems. Two-thirds of our sales and research organization today, are veterans of World War II production experience.

Now another rearmament program is getting into full swing. Changes on the production line are popping up again. And Houghton men are busy helping customers lick *today's* problems.

Your Houghton man can help you with many of your problems right on the spot. He can also draw on the wealth of production data our research staff has at its fingertips. For example, the list at the left shows some typical help we can offer on defense production today.

Meantime, to make some of our extensive experience immediately available to you, we have put it into quick reference form. Called "Houghton Defense Production Data", this 60-page illustrated book provides you with information that may save endless hours of searching—and costly trial-and-error experimenting.

Get timely help with your conversion problems by sending today for your copy of this valuable book. Fill out and mail the coupon to E. F. Houghton & Co., 303 West Lehigh Avenue, Philadelphia 33, Pa.

E. F. HOUGHTON & CO.

PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

E. F. Houghton & Co.
303 West Lehigh Avenue, Philadelphia 33, Pa.

Please send us a free copy of the new 60-page book, "Houghton Defense Production Data"

Name_____ Title_____

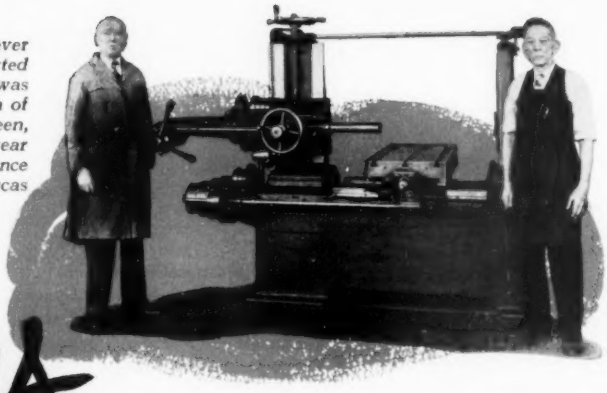
Company_____

Address_____

City_____ Zone_____ State_____

Metal Cleaners, Rust Preventives, Foundry Core Binders, Quenching Oils, Salt Bath Materials, Lubricants and Greases

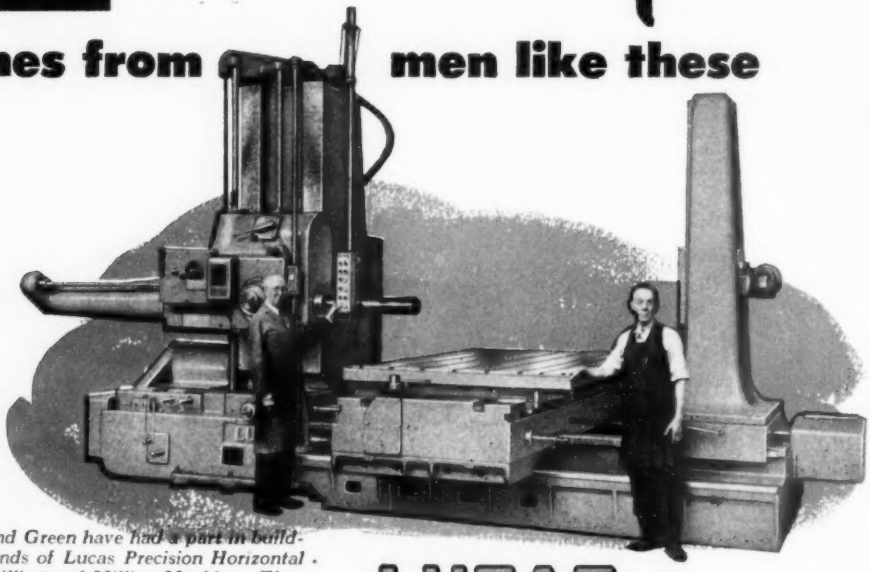
Here is the first Lucas Machine ever built. When Ed Wilde (left) started working at Lucas, this machine was brand new. Today Wilde is foreman of our Lathe Department. H. T. Green, Tool Room foreman joined us a year later. They have a combined experience and know how of 99 years on Lucas Machines.



Lucas Leadership

51 YEARS LUCAS OF CLEVELAND ONE PRODUCT

comes from men like these



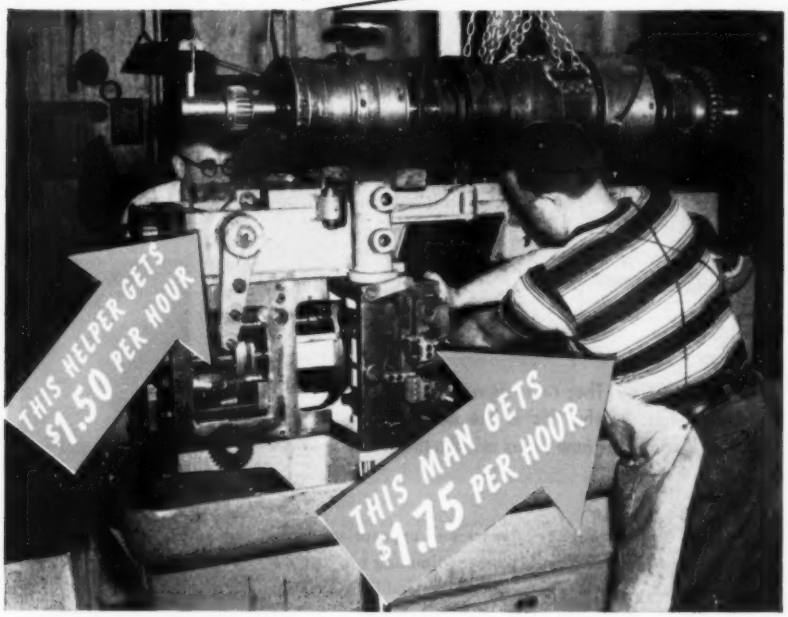
Wilde and Green have had a part in building thousands of Lucas Precision Horizontal Boring, Drilling and Milling Machines. They represent the concentration on the development and improvement of a single product over half a century that has kept Lucas far ahead of the parade.

LUCAS *Precision*

HORIZONTAL BORING, DRILLING AND MILLING MACHINES

LUCAS MACHINE DIVISION • THE NEW BRITAIN MACHINE CO. • CLEVELAND 8, OHIO

DON'T BE PENNY WISE *and* DOLLAR FOOLISH WHEN IT COMES TO GEARS



Down time (for disassembly, gear replacement, reassembly) — 4 hrs. minimum $13.00

Loss of 4 hrs. profit and overhead on this job $48.00

Sixty dollars lost because they "saved" ten per cent on a $10.00 pair of gears by buying inferior gears that quickly wore out and had to be replaced by BOSTON Gears ..... NET LOSS $60.00

Standardize on Stock Boston Gears

Design them into your equipment

Always specify them for replacements

For information and prices on over 3000 types and sizes, consult Boston Gear Catalog No. 55. Free copy on request.

BOSTON GEAR WORKS

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*Branch office and stock

LET'S TAKE ANOTHER LOOK AT SHIMS

"laminated shims cut our assembly time 10-20%"
—pump manufacturer

"reduced our gear mesh and end play problem"
—aircraft manufacturer

"gave us .002" accuracy with .063" tolerance"
—machine tool manufacturer

"shims are cutting our machine shop expense"
—diesel manufacturer

SHIMS ARE GOOD ENGINEERING. They cut costs without sacrificing the quality of your product. Surely, this is the acid test of a machinery component. And here is how shims achieve the results:

REDUCED MACHINING COSTS: With the use of shims as spacers in appropriate situations, your machinery tolerances can be more flexible. Accurate shimming can achieve the final adjustment required. No standby lathe is required during assembly operations.

REDUCED ASSEMBLY TIME: Final fitting can be achieved right at the job. Parts do not need to be assembled, then disassembled and removed for further machining, grinding or filing of a few thousandths. Shims will make the adjustment immediately and easily.

REDUCED LABOR COST: Obviously, reduction of machining or assembly time reflects in lowered costs. But in addition, assembly with shims is a less skilled operation than assembly involving intermittent machining operations. No new skill is needed.

AN ADDED SERVICE FEATURE: The use of shims, particularly our own LAMINUM shims, gives you an added service feature. When parts are worn by use, the simple removal of a shim lamination can restore clearance to original requirements. Here is an exclusive feature for take-up of wear during the entire life of the machine.

Split bearing adjustment. Lathe head stock spindle bearing.

Bevel gear mesh adjustment for agricultural machinery.

Babbitted shim in bearing adjustment. Internal combustion engine.

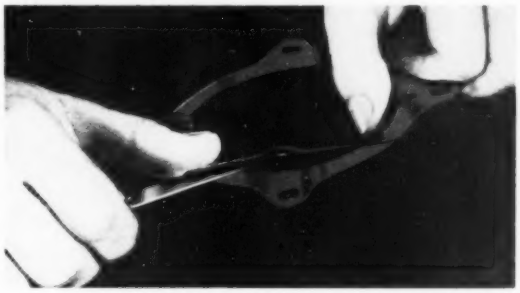
LAMINUM
THE SOLID SHIM THAT rolls FOR ADJUSTMENT

SHIM ENGINEERING DATA FILE
Send for it today. Full of facts and specifications on shim materials.

4 GENERAL TYPES OF SHIMS ARE AVAILABLE

LAMINUM® SHIMS—simply peel for adjustment

Laminated shims actually peel off in .002 or .003 inch layers, providing a simple, but very accurate adjustment in spacing. The laminations peel easily with a penknife, yet the shims are in a solid unit, bonded over their entire surfaces. There's no counting, stacking or miking, as with loose leaf, separate shims. Gauge is always known. No grit can lodge between layers. The LAMINUM shim is actually less compressible than solid metal.



Laminated shims are stamped from brass or steel LAMINUM, the "metal that peels." They're made up of layers of .002 or .003 inch brass or steel, metallically bonded together over their entire surfaces.

Herringbone gear mesh and thrust bearing adjustments. Rotary pump.

Tapered roller bearing adjustment. Oil well drilling equipment.

Gear and magneto mounting adjustment. Aviation engine.

SPOT-SOLDERED SHIMS

Shim packs can also be provided, made up of any prescribed number of laminations with edges tack-soldered (brass only). This method of grouping laminations has some disadvantages, but meets with occasional acceptance by some designers and production men for special applications.

LOOSE LEAF SHIMS

Loose leaf shims, of course, require counting and stacking but have the occasionally important advantage of allowing a variety of shim thicknesses. No significant economy is effected because, unlike the LAMINUM shim pack each leaf is stamped as a separate unit.

SPECIAL SHIMS FOR SPECIAL PROBLEMS

For special applications, we have devised other patented methods of joining laminations together for use in packs, particularly when the purchaser has been interested in the split second use required for high speed production.

We have made untold millions of shims in our 38 years devoted to this work. This experience might well provide an easy solution to your shim engineering problem.

The solving of your very knottiest shim problem is work that we solicit most eagerly, without obligation to you. Such assignments best further our own knowledge of shim engineering for our mutual benefit. And, inasmuch as we manufacture all types of shims, we feel well qualified to recommend impartially to you.

SHIM STOCK packaged for instant use without fumbling or waste.

Available from your Industrial Distributor, only.

RUGGED CARTON DISPENSERS

STURDY FLAT PACKETS

THE 4-GAUGE ECONOMY CARTON

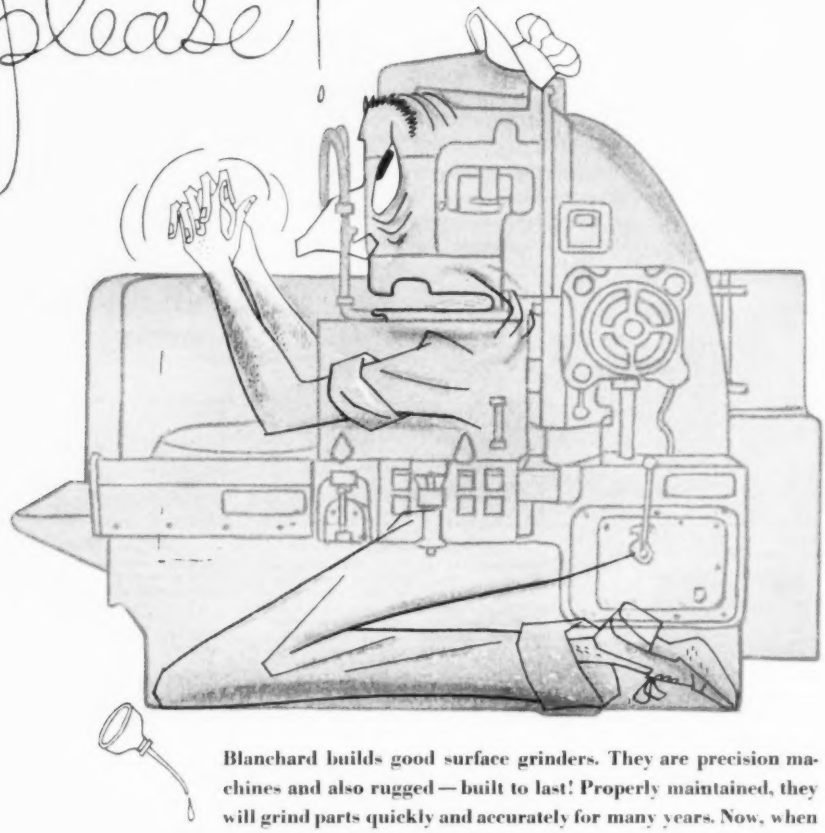
THE METAL DISPENSING RACK

LAMINATED SHIM COMPANY, Inc.

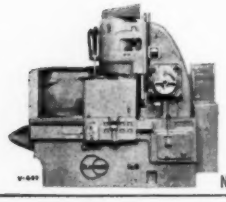
CUSTOM SHIMS • STAMPINGS • SHIM STOCK

3110 UNION STREET • GLENBROOK, CONN.

please!



Blanchard builds good surface grinders. They are precision machines and also rugged — built to last! Properly maintained, they will grind parts quickly and accurately for many years. Now, when the urgent demands of defense industries are lengthening delivery dates on new Blanchard grinders, it is vitally important that you take good care of the Blanchards you now have. When operating on two shifts, machines should be cleaned, oiled and greased twice as often — on three shifts, three times as often! Complete maintenance instructions are shipped with every new Blanchard grinder. If you would like an additional copy, just drop us a card giving the serial numbers of your grinders. Taking good care of your Blanchards will enable them to take good care of you!



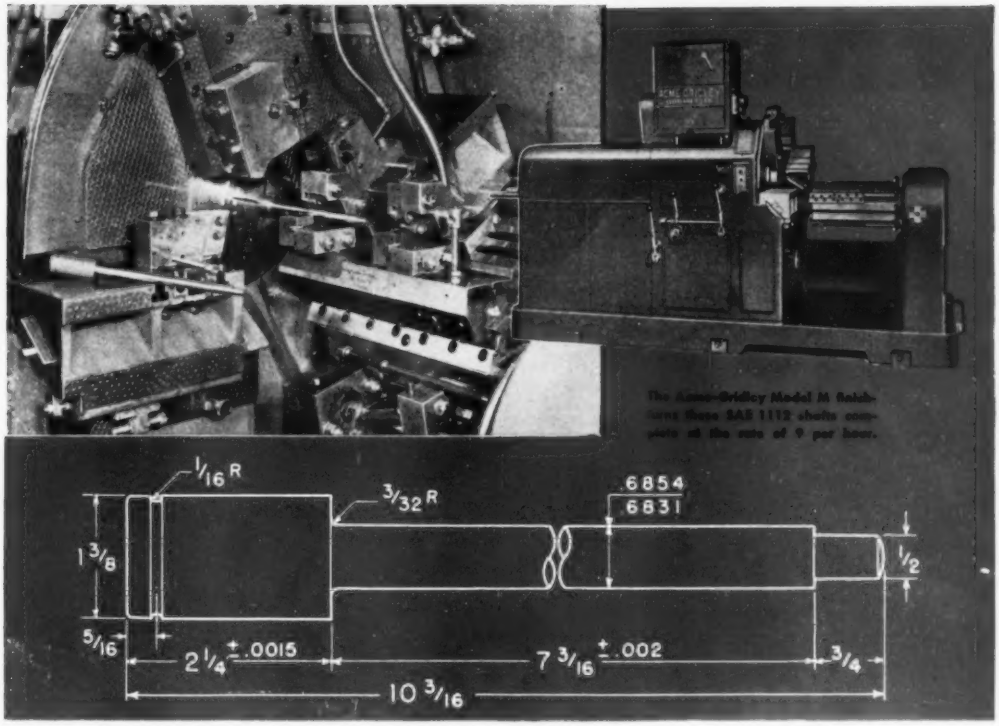
NO. 18 BLANCHARD SURFACE GRINDER

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



THREE TIMES FASTER

—with fine finish and close tolerances

ALL ON AN ACME-GRIDLEY MODEL M AUTOMATIC

Turning long diameters to close tolerances can be tricky—but the new Acme-Gridley Single Spindle Model M Automatic takes exacting jobs like this in stride.

Its wide, open tooling zone and rugged frame are ideal for the special tooling such work requires. In the case-study illustrated, for example, there's plenty of room for the special independent accelerated drive used to get fine finish, and for the roller supports that help preserve close tolerance. Frame strength adequate for high-speed or carbide tools contributes to production records like this three-times-faster performance of nine shafts per hour.

There are other production-increasing advantages, too: eight independently operated tool slides and three ranges of automatic spindle speeds permit the use of the best speeds and feeds for each cut.

Ask for production estimates on your jobs.

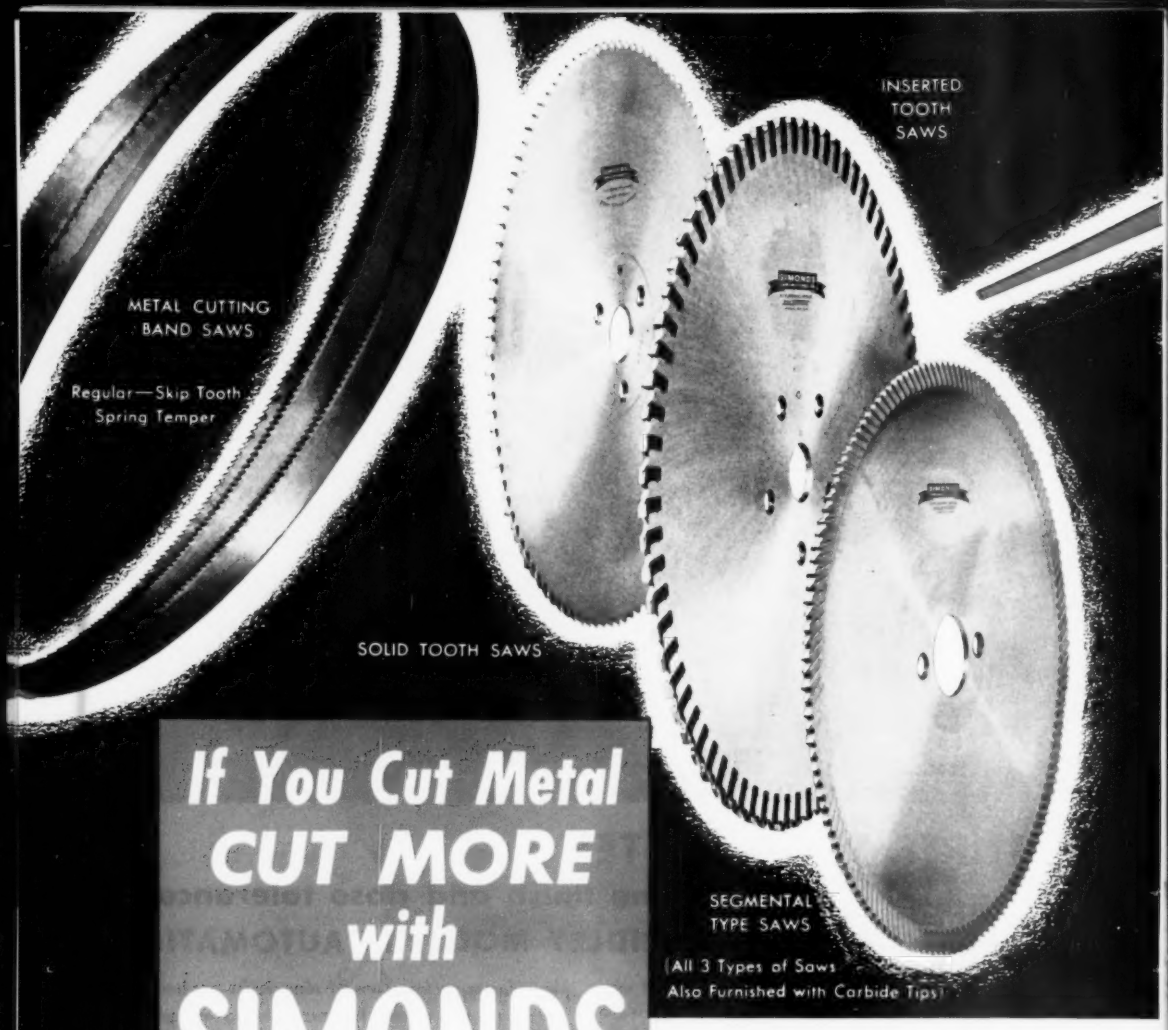
Acme-Gridley Model M Automatics are built in three capacities: 3½", 4½" and 5½". For complete information ask for Bulletin M-50.

Machine obsolescence is the creeping paralysis that strangles profits.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing



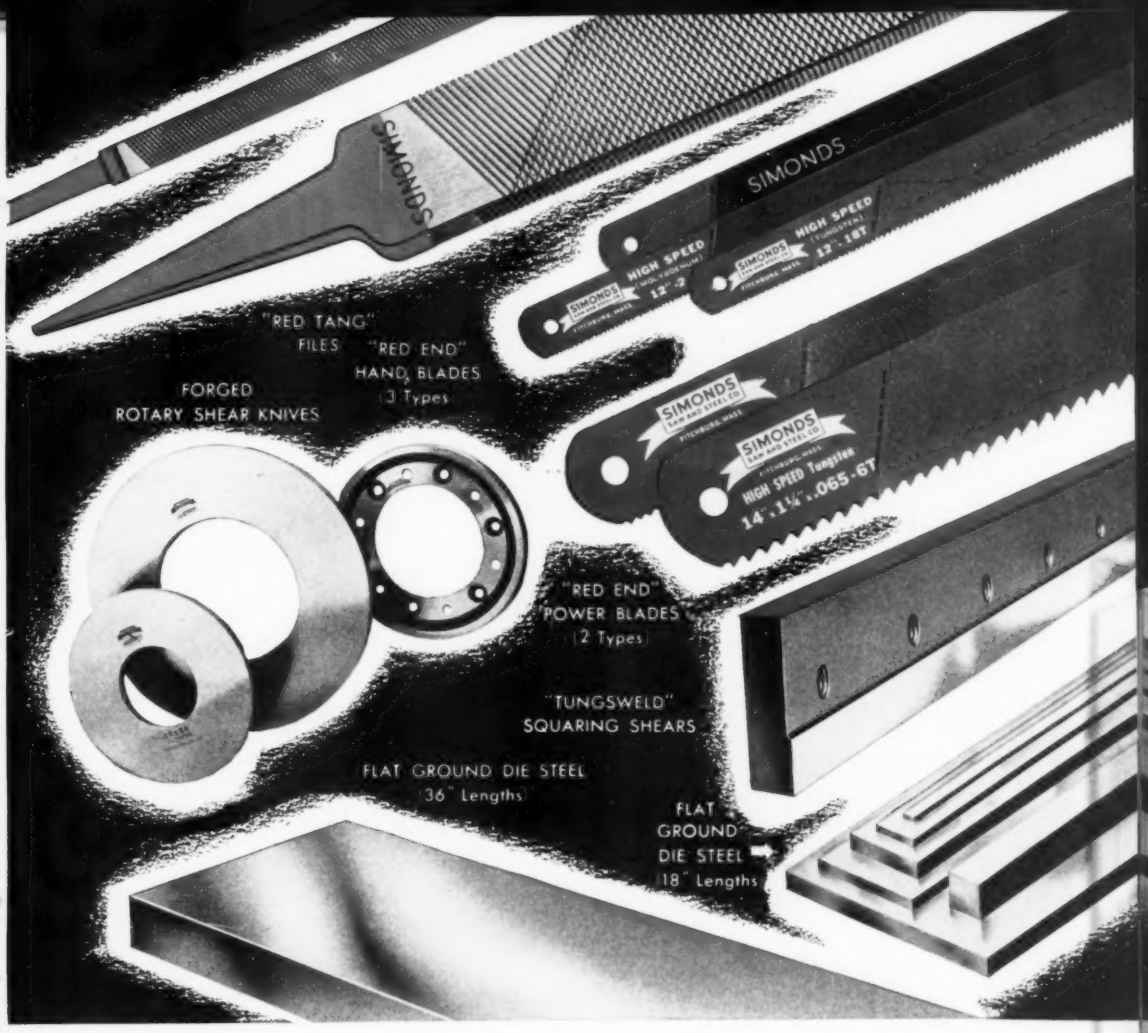
If You Cut Metal CUT MORE with SIMONDS Industrial Line

Over 100 years devoted to the ideal of developing the foremost line of cutting tools in this country . . . that's what underwrites every purchase you make of any product in the Simonds Line.

And don't forget this: You get 100% Simonds Quality Control . . . beginning with steels processed *for your job* from Simonds own steel mills . . . and going all the way through Simonds famous Windowless Plant (first in this country).

Here, in this completely controlled-conditions plant, modern straight-line production methods are

The Simonds Line is



implemented by special equipment to produce cutting tools of *one quality only* . . . Simonds TOP Quality.

And you can bank on it that these Simonds Tools will deliver top performance on *any* job . . . from hand filing and hacksawing, to production machine cutting with saws of all types and sizes. So, if low-cost and high-level production are vital to you . . . then specify "Simonds" to your distributor or dealer on any requirement you may have on which the tools shown above will serve.

Remember: *You start to save, the minute you say SIMONDS!*

SIMONDS
SAW AND STEEL CO.

FITCHBURG, MASS.

Branch Offices in Boston, Chicago, San Francisco and Portland, Ore. Canadian Factory in Montreal, Que.

the Production Line

Airco Heliwelding process slashes costs...

EASILY JOINS THE "HARD-TO-WELD METALS"

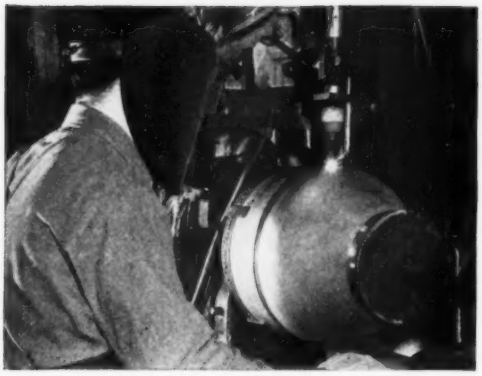
Heliwelding is one of Airco's inert, gas-shielded, arc-welding processes that permits all-position welding of aluminum, magnesium, stainless steel, brass and copper.

Particularly in the lighter sections of these materials, this time-tested, easy-to-use process has proved most economical. Older methods generally require use of fluxes . . . but the envelope of inert gas that shields the weld eliminates the need for flux . . . no slag is formed, thus permitting the operator a clear view of the puddle resulting in welds that are of unexcelled quality with such smooth contours that finishing is reduced to a minimum. This means savings in time, trouble and money.

Furthermore, Heliwelding's special characteristics — the complete gas shielding of a non-consumable electrode — provide a highly efficient and concentrated arc, which, in turn, permits welding at exceptionally high speed.

Another outstanding feature of Heliwelding is its minimization of distortion. This is due to its high speed operation with a small diameter electrode. Heat is concentrated to a pin point and moved rapidly along the work . . . thin sections are easily joined and protected by the fact that such a small amount of weld metal is required.

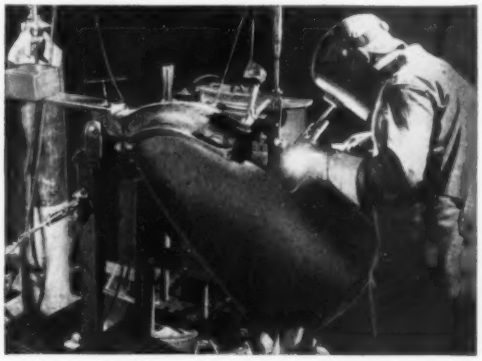
The case studies shown on these pages give you some idea how this exceptional process could help you. While the facts may be startling, they could very easily be applied in your own shop . . . but find out for sure. Write . . . or phone your nearby Airco office. Ask for a copy of ADC-709: "Heliwelding — Catalog 9".



CUTS TIME AND MONEY COSTS . . . Hinman Milking Machine Company of Oneida, N. Y., found Heliwelding's ability to join stainless steel without a flux ideally suited to the fabrication of pails to be sold in conjunction with their milking machines. Top quality pails were produced quickly and easily; machine finishing was virtually eliminated and polishing reduced to a minimum — tidy savings of money . . . and time.

BUILDS A BETTER PRODUCT . . . Ducate Brothers, of Little Ferry, N. J., used Heliwelding to speed production and save cost in the fabrication of copper tanks for hot water heaters. They found this outstanding process extremely fast — and resulting in smooth, high-type welds greatly increasing the quality of the finished product.

PERMITS MECHANIZED MASS-PRODUCTION . . . Salkover Metal Processing Corp., of Long Island City, N. Y., adapted Heliwelding for mass-producing copper rotors for induction motors. Immediately production jumped to a new high, and costs dropped. Furthermore, Heliwelding permitted complete control of all operating variables — resulting in finer welds, with a minimum of rejects.



ELIMINATES DISTORTION . . . A prominent automobile manufacturer found Heliwelding most practical, both from a speed and finishing standpoint. Operating at 13″ per minute, Heliwelding produced a weld metal free from porosity and pinholes — distortion and splitting were completely eliminated on the .042″ sheet metal used to produce fender and similar assemblies.

AIRCO

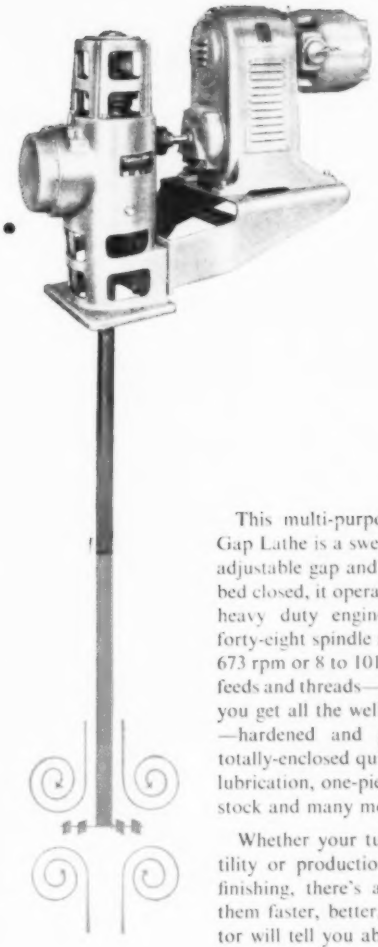
AIR REDUCTION

AIR REDUCTION SALES COMPANY • AIR REDUCTION MAGNOLIA COMPANY
AIR REDUCTION PACIFIC COMPANY
REPRESENTED INTERNATIONALLY BY AIRCO COMPANY INTERNATIONAL
Divisions of Air Reduction Company, Incorporated
Offices in Principal Cities

giant

Versatility of this new LeBlond 16"/38" Sliding Bed Gap Lathe is demonstrated at Mixing Equipment Co., Inc., Rochester, New York. The irregularly-shaped semi-steel base (below) swings 33", overhangs 18" – depth of cut (intermittent), 3/32"; spindle speed, 86 rpm; feed, .014"; tool, carbide. The 14" AISI 304 stainless steel shaft and coupling (above) are accommodated (without special equipment) by extending the bed – the coupling is turned to limits of .001"; depth of cut, 1/16"; spindle speeds, 166 rpm roughing, 212 rpm finishing; feed, .010"; tool, carbide.

"eggbeaters" for industry



These huge mixers (up to 500 hp) do a big job of "eggbeating" for industry. They're used to blend chemical formulations—to mix pulp for paper—to combine ingredients for thousands of everyday products.

In producing these mixers, Mixing Equipment Co., Inc. of Rochester, New York, has to turn a variety of work . . . from short parts with irregular swings up to 33", to shafts as long as 14'—materials from brass to stainless steel—intermittent cuts to heavy roughing cuts to smooth finishing cuts—tolerances down to .001". All this calls for a rugged precision lathe of unusual versatility. That's why Mixing Equipment Co., Inc. installed a new LeBlond 16" 38" Heavy Duty Sliding Bed Gap Lathe, recommended by LeBlond Distributor, F. W. Schiefer Machinery Company of Rochester.

This multi-purpose LeBlond Sliding Bed Gap Lathe is a sweetheart in the shop. It has adjustable gap and center distance, and with bed closed, it operates the same as a standard heavy duty engine lathe. Twenty-four or forty-eight spindle speeds are available, 11 to 673 rpm or 8 to 1010 rpm, respectively—sixty feeds and threads—up to 15 hp. And of course you get all the well-known LeBlond features—hardened and ground steel bed ways, totally-enclosed quick-change box, automatic lubrication, one-piece apron, thrust-lock tailstock and many more.

Whether your turning jobs call for versatility or production, heavy hogging or fine finishing, there's a LeBlond Lathe to turn them faster, better. Your LeBlond Distributor will tell you about the three Sliding Bed Gap Lathes, 16"/38", 25"/50" and 32"/60". Call him or write—

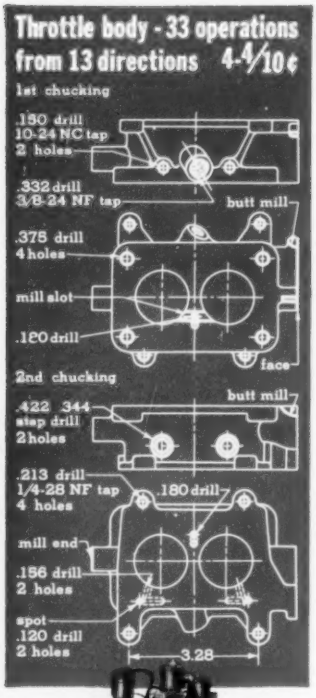
THE R. K. LEBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO

Ask for Bulletin SBG 103 A for complete information on LeBlond Heavy Duty Sliding Bed Gap Lathes.

turned faster by **LeBLOND** *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 64 YEARS*

Angular operations at low cost



310 PARTS AN HOUR GROSS. This 60-inch indexing machine operates 32 tools in 2 chuckings. It has 14 automatic units that point in these 9 directions:

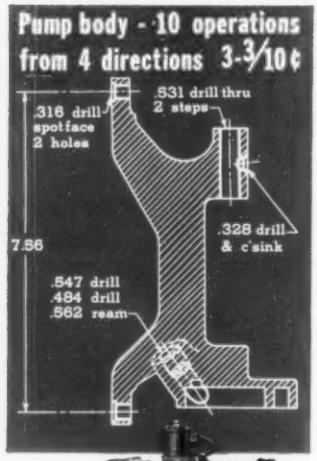
On the central column—
- 2 — vertical*
- 1 — 10° off vertical, 13° left
- 1 — 10° off vertical, 13° right

On angular columns—
- 2 — 29° off vertical, 32° left
- 1 — 15° off vertical, radial*

On knees attached to the base—
- 1 — 8° off horizontal, radial*
- 4 — horizontal, radial*
- 1 — horizontal, 26° left
- 1 — horizontal, 26° right

(*These operate on both chuckings.)

- Six of the 14 units have multi-spindle auxiliary heads.
- Bushings guide all drilling, butt milling and spotting tools.
- One end mill performs 2 operations—faces the right side, 1st chucking, and mills the left end, 2nd chucking. The operator can adjust for cutter wear.
- The .180 hole in the center of the slot is drilled at an angle from both ends, one per chucking. Both chuckings locate on the throttle bores so accurately that the hole is straight.



200 PARTS AN HOUR GROSS. This 20-inch indexing machine operates 10 tools from 4 directions in 1 chucking.

- Two vertical units drill the .531 hole in steps to keep the output up.
- Three units on angular columns drill and ream the .562-.484 hole.
- Two 2-spindle horizontal units drill and spot face the two .316 holes.
- One horizontal unit operates a combination .328 drill and countersink from the rear across the index table.

KINGSBURY

AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production

Drilling and tapping units operate here from 4, 5 or 8 directions per chucking

Dear Sir:

These machines use automatic drilling and tapping units mounted —
- — on vertical columns
- — on angular columns
- — in angular adapters
- — horizontally and radially
- — horizontally off the radial line
- — on the other side of the index table.

One Kingsbury operates on a throttle body from 13 directions in 2 chuckings. The other machine operates on a pump body from 4 directions in 1 chucking That is one advantage of using independent drilling and tapping units.

Other advantages

Independent units also make possible:

Closer tolerances. We can locate the spindle to exact indicator readings.

Proper feed. Single-spindle units perform operations requiring different feeds. (For operations of similar size and depth, units with multi-spindle heads are more economical.)

Changes in hole location. You can relocate these units without too much trouble.

These unit costs are low

For all 32 operations on each throttle body, man and machine cost 4-4/10c. For all 10 operations on each pump body this cost is 3-3/10c. Here is the basis: a high wage rate, 80% efficiency and the cost of the entire machine amortized over 6000 hours, a fraction of its profitable life. (No power or overhead.)

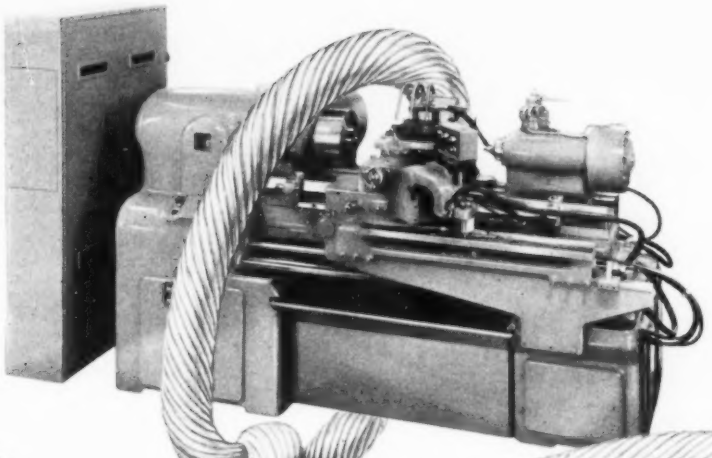
Where unit costs were high

Once upon a time a friend of ours saw several Kingsburys in a plant far from any of our dealers. A lot of men stood by each machine. One loaded and unloaded parts. The others tripped the units after the table indexed. "Don't these units have an air trip control?" he asked. They did. In an hour or so he had all the machines running properly. That night company officials wined and dined him. He had no idea how long the party lasted.

Your unit costs can be low

If you do operations such as these on high production parts, a machine that combines operations is a good bet (at least if you see the instruction manual). To prove it, let us make you a proposal. Just send a print to our Mr. L. A. Carll. Tell him the operations and hourly output you need. Or ask him for free bulletins that show 40 setups. 93-R

Sincerely,



90% SAVINGS

with a String Attached!

Here it is in a nutshell, fresh from the Monarch Mona-Matic installation at the Sargent Engineering Corporation of Huntington Park, California. The part is a fork 6″ x 2″ OD, made from a 4130 chrome-moly forging heat treated to a hardness of 125,000-145,000 psi before machining—"a tough machining problem from the beginning." Now, look what happened to the production time when the Mona-Matic went to work:

THEN		OPERATION	NOW	
Turret Lathe	30 min.	Rough Cut	Mona-Matic	5 min.
Engine Lathe	10 min.	Semi-Finish Cut		
Grinder	10 min.	Finish		
3 Machines	50 min.		1 Machine	5 min.

That's a 90% reduction in machining time alone, and it's just the start! Set-up time for the job has shrunk from more than 3 hrs. to less than 20 min. One machine has replaced three. Only one operator is required (and he could easily handle two Mona-Matics if necessary). Add it all up—and is there anything we have to add?

What is this machine that consistently turns out production savings like this on short runs and long ones alike? That's where the string on the story comes in! Aren't you convinced that you'd better return our handy coupon right now? . . .
The Monarch Machine Tool Co., Sidney, Ohio.

THE MONARCH MONA-MATIC *(Main Illustration and Above, with Work Piece).* This is a new but widely approved approach to production metal turning. Use of a single tracer-controlled running tool speeds production, slashes tool costs, tool change time and set-up time, increases accuracy, and slashes time required for subsequent grinding operations. Available with magazine load.

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

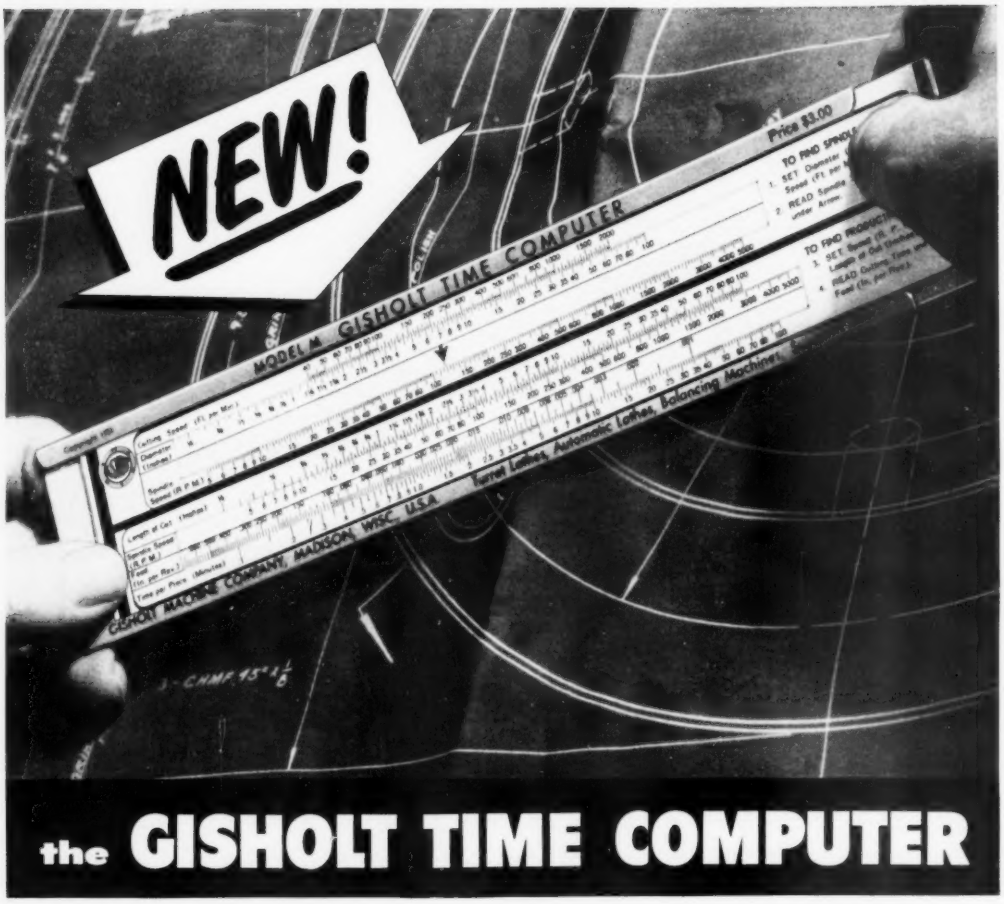
Gentlemen: I am interested in your Mona-Matic story and would like to receive your illustrated Booklet, with complete data and job performance reports. Please send me your Booklet 1804 without obligation.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____


NEW!
MODEL M GISHOLT TIME COMPUTER
Price $3.00
GISHOLT MACHINE COMPANY, MADISON, WISC. U.S.A.
Turret Lathes, Automatic Lathes, Balancing Machines

the GISHOLT TIME COMPUTER

to help you figure cutting speeds, feeds and time on all kinds of machining jobs!

Here's the new Gisholt Time Computer! Simple as A-B-C to operate. It saves you hours of figuring . . . does away with guesswork . . . gives you the right answer every time—in just seconds.

You need one if you are a process engineer, time study man, engineering estimator—or if involved in any way with job costs and setups. The new Model M Gisholt Time Computer covers the whole range of spindle speeds from 5 to 5,000 r.p.m., and feeds from .001″ to 1.0″ per minute.

The cost? It's trifling . . . only $3.00! You can't afford to be without it. Call your Gisholt representative. Or, if it's easier for you, mail the coupon with check.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

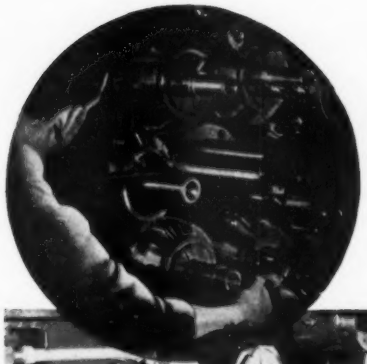
Use this COUPON!

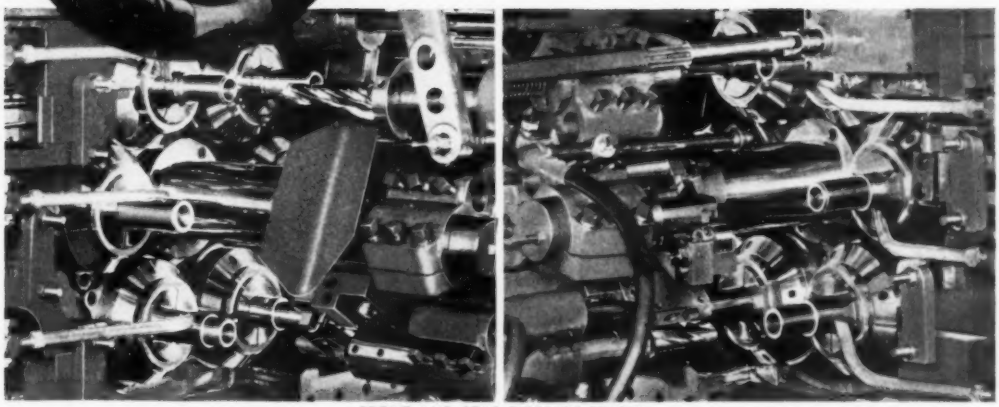
Gisholt Machine Company, Madison 10, Wisconsin
Please send me ....(number) Gisholt Time Computers at $3.00 each. $.....is enclosed.

Name.....
Company.....
Address.....
City.....Zone.....State.....

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

NO NEED TO "SETTLE" FOR LESS





FRONT AND REAR SIDES OF 2⅝-SIX

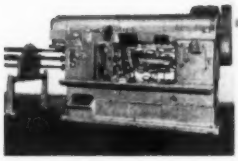
Multiple Spindle Bar Automatics produce more work per square foot of floor space than do other types of metal cutting machine tools. But, when *one* spindle is "down" *all* are "down." It's why dependability will always be the outstanding requirement of the "Automatic."

So many factors are involved in dependability that any weakness in design, engineering, material, or construction, will eventually contribute to higher costs of operation and maintenance.

Part of any new machine's service to the prospective user is the availability of *full* information. No prospective purchaser need "settle" for less. At least it's that way with CONOMATICS.

In producing the piece shown, on a 2⅛-SIX, the eccentric forming attachment (see upper right illustration) combines the well known CONOMATIC facilities of form tool support and "all position" attachment spindle drive.

A Comparison of ALL Automatics is in favor of Cone



Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

OK series 3600
the BLACK ANGUS of face mills with...

More Beef in the Body

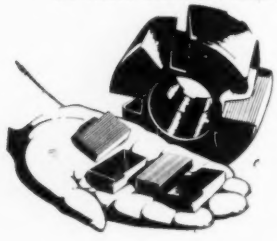
For the heaviest cuts that the biggest milling machines can pull.

OK Face Mills, size for size, have more weight, more substance, more beef in the body. And blades are huskier with a greater proportion of carbide available for cutting. It is a proven fact these cutters remove more metal in a given period than other cutters which are complicated and weakened by recesses for screws, pins, gibs or locking devices.

OK cutters consist of just two components – the body and the blades. Blades are simple wedge-shaped blocks, serrated on one face with matching serrations in the body. They are solidly seated by a driving fit, easily extracted with a drift, and stay put under the fastest speeds and heaviest feeds. The simple strength and ruggedness permit the placement of more blades in the fine pitch series and heavier blades in the coarse pitch series.*

You need the OK competitive advantages. Take your toughest job and let OK engineers have a go at it.

***The wedge is the world's simplest and strongest basic mechanical device.**



OK

modern milling cutters for modern milling machines

THE O.K. TOOL COMPANY, MILFORD, N. H.

Photo courtesy Production Machine Co., Greenfield, Mass.

Tapping 8 pieces or 8000?

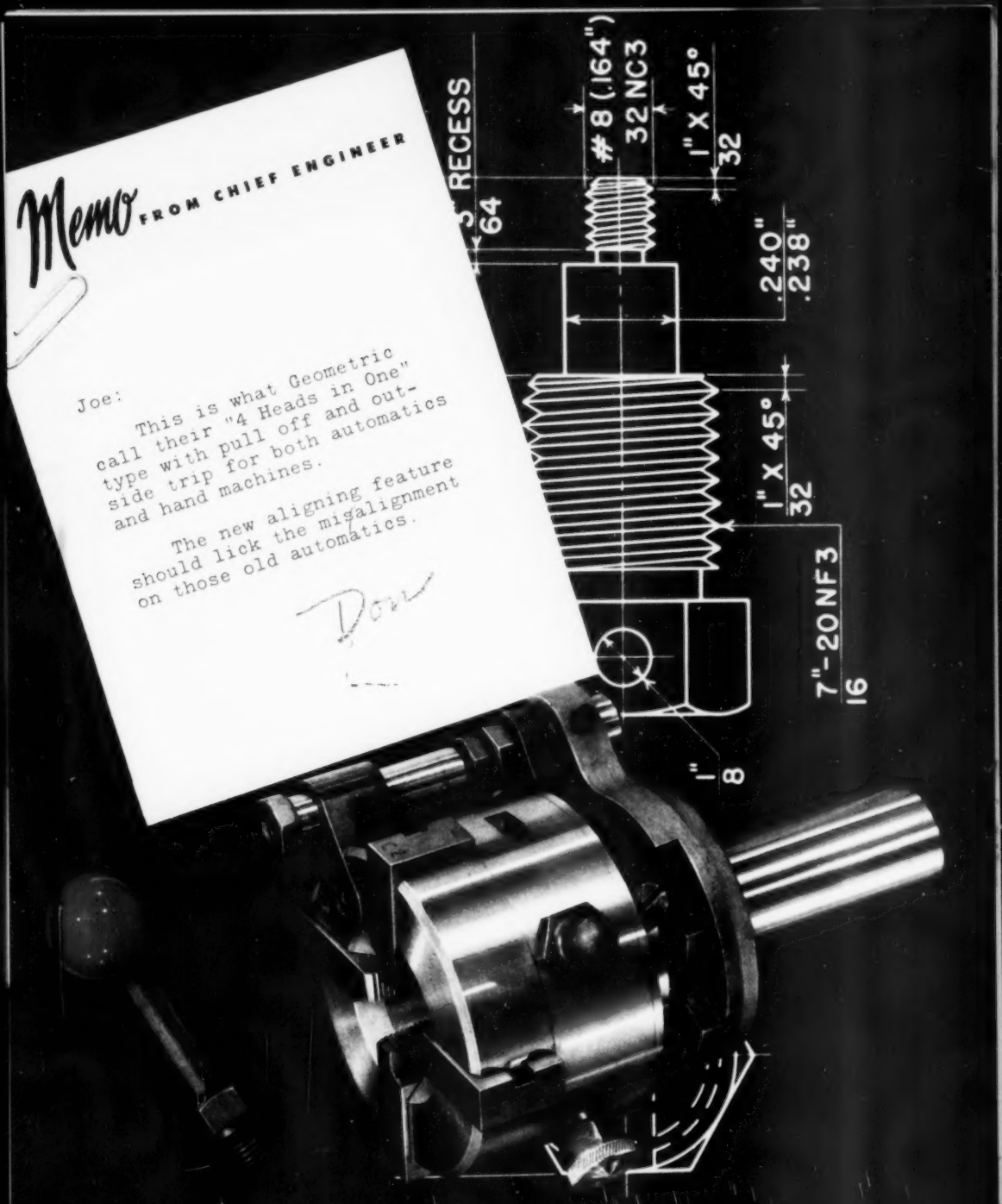
Whether your tapping application is a small-scale job depending on the skill of the operator, or a continuous large-scale operation where down time means troublesome production loss and taps just *have* to be right, you'll like GREENFIELD Taps and GREENFIELD Service.

And, whether you need only a few specially designed taps for a specific job or thousands of identical taps for year-in-year-out operation, you'll also like GREENFIELD Taps and GREENFIELD Service.

At "Greenfield" no tapping job is too small, and no tapping job is too large. For "Greenfield" Taps call your nearest Distributor.

GREENFIELD TAP AND DIE CORPORATION
Greenfield, Massachusetts

BUY GTD GREENFIELD!



GEOMETRIC TOOL COMPANY DIVISION

Greenfield Tap and Die Corporation

NEW HAVEN 15, CONNECTICUT

Pick the men who changed to CIMCOOL

It's easy to spot the men who changed to Cimcool° — the radically new and different cutting fluid. You'll know them by their broad smiles. Naturally they're happy! For Cimcool covers 85% of all metal cutting operations. And does a *better job.*

This revolutionary cutting fluid—this *chemical emulsion*—replaces all water emulsions and all but a few highly compounded specialty oils. Cimcool permits faster speeds and increases tool life because it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned cutting fluids. It's longer lasting in machines, too. So Cimcool reduces down-time and cuts labor costs for cleaning and changing.

We sincerely believe that one week's run will convince you. And we'll be pleased to provide a demonstration in one of your own machines. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you. Or, if you prefer, write for our free booklet "Cimcool Gives the Answers." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U. S. Pat. Off.

A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

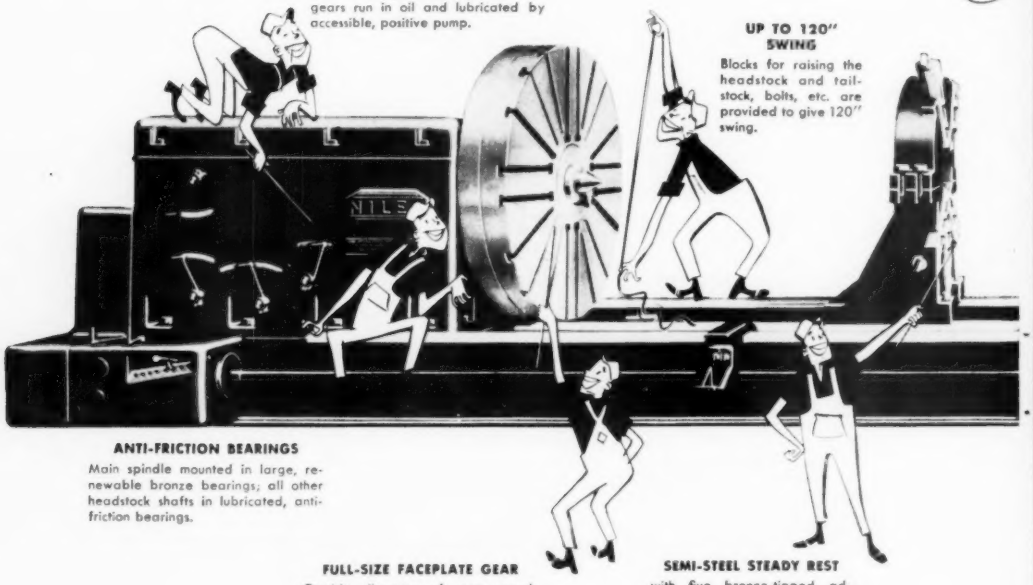
for 85%
OF ALL METAL CUTTING JOBS

BRUTE FORCE

precision for

COMPLETELY-ENCLOSED HEADSTOCK
Contains large-diameter, wide-face gears run in oil and lubricated by accessible, positive pump.

UP TO 120" SWING
Blocks for raising the headstock and tailstock, bolts, etc. are provided to give 120" swing.



ANTI-FRICTION BEARINGS
Main spindle mounted in large, renewable bronze bearings; all other headstock shafts in lubricated, anti-friction bearings.

FULL-SIZE FACEPLATE GEAR
Outside diameter of gear equals outside diameter of faceplate to give strongest construction.

SEMI-STEEL STEADY REST
with five bronze-tipped, adjustable steel jaws. Designed for easy, fast clamping to the bed —for easy removal.

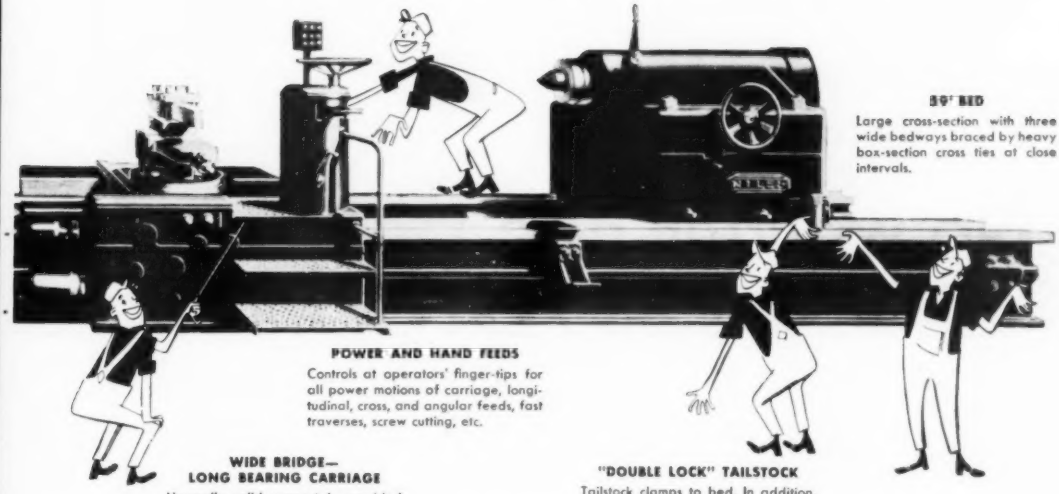
This Niles 91" is beefed-up for the big jobs. It has the strength and stamina to withstand the pressures and stresses of deep-cutting carbide tools—yet feather-tip precision to give fine finish and accurate dimensioning. It's made for fast, better production—for better utilization of every moment of operating time.

Write the
LIMA-HAMILTON DIVISION
Hamilton, Ohio

BALDWIN · BLH · LIMA-HAMILTON

BALDWIN

for ROUGHING *finishing with this* NILES 91"



59' BED
Large cross-section with three wide bedways braced by heavy box-section cross ties at close intervals.

POWER AND HAND FEEDS
Controls at operators' finger-tips for all power motions of carriage, longitudinal, cross, and angular feeds, fast traverses, screw cutting, etc.

WIDE BRIDGE—LONG BEARING CARRIAGE
Unusually solid support is provided directly under tool with bridge bearing on the full width of tracks.

"DOUBLE LOCK" TAILSTOCK
Tailstock clamps to bed. In addition, a tailstock pawl engages a removable rack in center of bed.

When tooling up for *big* jobs check Niles. You'll find lathes to 120", boring mills to 43', planers to 15' in the standard line. If you require greater capacities, Niles can make them.

More than 100 years of experience go into the design of every Niles tool—your guarantee of strength, rigidity, accuracy for the toughest jobs.

And now, under the Baldwin-Lima-Hamilton name, there are expanded manufacturing facilities, expanded engineering skills, expanded services to give you even greater satisfaction.

Write *today!* Our representatives will be glad to show you how Niles tools can speed your big jobs—and do them at lower cost to you.

-LIMA-HAMILTON

GENERAL OFFICES: PHILADELPHIA 42, PA. **OFFICES IN PRINCIPAL CITIES**

No wonder he's happy - - -

HE'S USING *PRATT & WHITNEY*

MACHINE TOOLS

Jig Borers
Precision Rotary Tables
Vertical Shapers
Toolroom Lathes
Automatic Lathes
Automatic Centering Machines
Thread Millers
Vertical Millers and Profilers
Die Sinkers
Automatic Duplicating Machines
Keller Tracer-Controlled Milling Machines
Cutter and Radius Grinders
Vertical Surface Grinders
Vertical Die and Surface Grinders
Gear Grinders
Deep Hole Drillers
Kellerflex Flexible Shaft Machines
Diaform Wheel Forming Attachment

CUTTING TOOLS

Taps (all types)
Dies (all types)
Screw Plates
Milling Cutters
Metal Slitting Saws
Multiple Thread Milling Cutters
Form Cutters
End Mills
Profiling Cutters
Die Sinking Cutters
Keller Cutters and Tracers
Twist Drills
Deep Hole Drills
Reamers (all types)
Counterbores
Cut-Off Blades
Thread Rolling Dies
Solid Carbide and Carbide Tipped Tools
Kellerflex Burs (Steel and Carbide)

GAGES

Cylindrical Plugs and Rings (Steel and Carbide)
Thread Plugs and Rings (Steel and Carbide)
Pipe Thread Gages (Plugs and Rings)
Snap Gages (AGD Adjustable Limit)
Snap Gages (Roll Thread)
A.P.I. (Oil Country) Gages
A.A.R. (Railroad) Gages
Precision End Measures
Universal Internal Comparators
Hoke and USA Precision Gage Blocks (Steel and Carbide)
Supermicrometers
Standard Measuring Machines
Electro-Mechanical Lead Testers
Electrolimit Comparators
Air-O-Limit Comparators
Tri-Roll Thread Comparators
Continuous (Mill) Gages
Multiple Station Gages
Special Gages

BRANCH OFFICES: Birmingham • Boston • Chicago • Cincinnati
Cleveland • Dallas (The Stanco Co.) • Detroit • Houston (The Stanco Co.)
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Any job he tackles turns out right — within the tolerances given on the print. Why? Because he's working with PRATT & WHITNEY Precision Machine Tools, Cutting Tools and Gages. No wonder he's good!

Skilled men, working with precision tools, will turn out better work — faster.

PRATT & WHITNEY

Division NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U.S.A.

Dedicated to Accuracy for 91 years

HARDINGE-SJOGREN

HARDINGE
ELMIRA, N.Y.

SPEED

Collet Chucks with HARDINGE STEEL COLLETS

Available in Five Sizes:
1", 1⅜", 1¾", 2¼", and 3½" collet capacity.

for Accuracy and Durability at Low Cost

When you order Hardinge-Sjogren Chucks and Hardinge **Steel** Collets you get all these advantages:

1. Complete Capacity for Hexagon and Square as well as Round.
2. Lowest Initial Cost.
3. Longest Service Life.
4. Grips both **short** and long lengths properly.

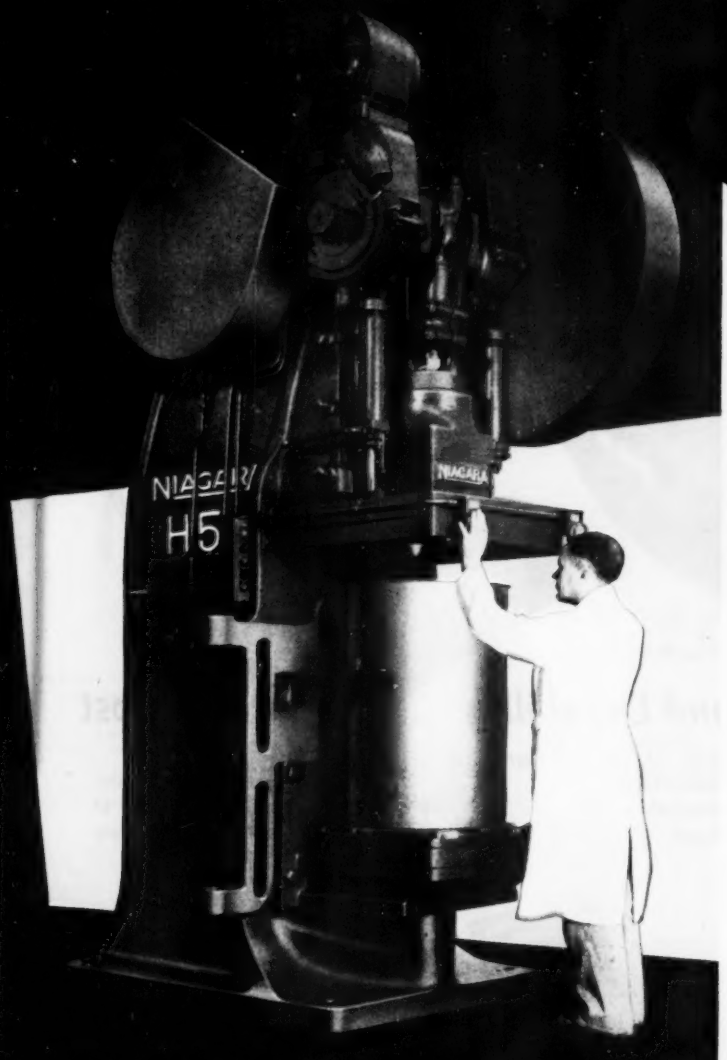
. . . . . and HARDINGE tempered steel collets assure you of quick release, sustained accuracy and durability.

Write for Bulletin 8— complete information on **HARDINGE-SJOGREN Chucks and Collets.**

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

NIAGARA



Niagara H-5 Geared Horn Press with air sleeve clutch and air releasing brake. Arranged with special table and dies for curling and flanging the ends of a 55 gallon 18-gage steel drum body.

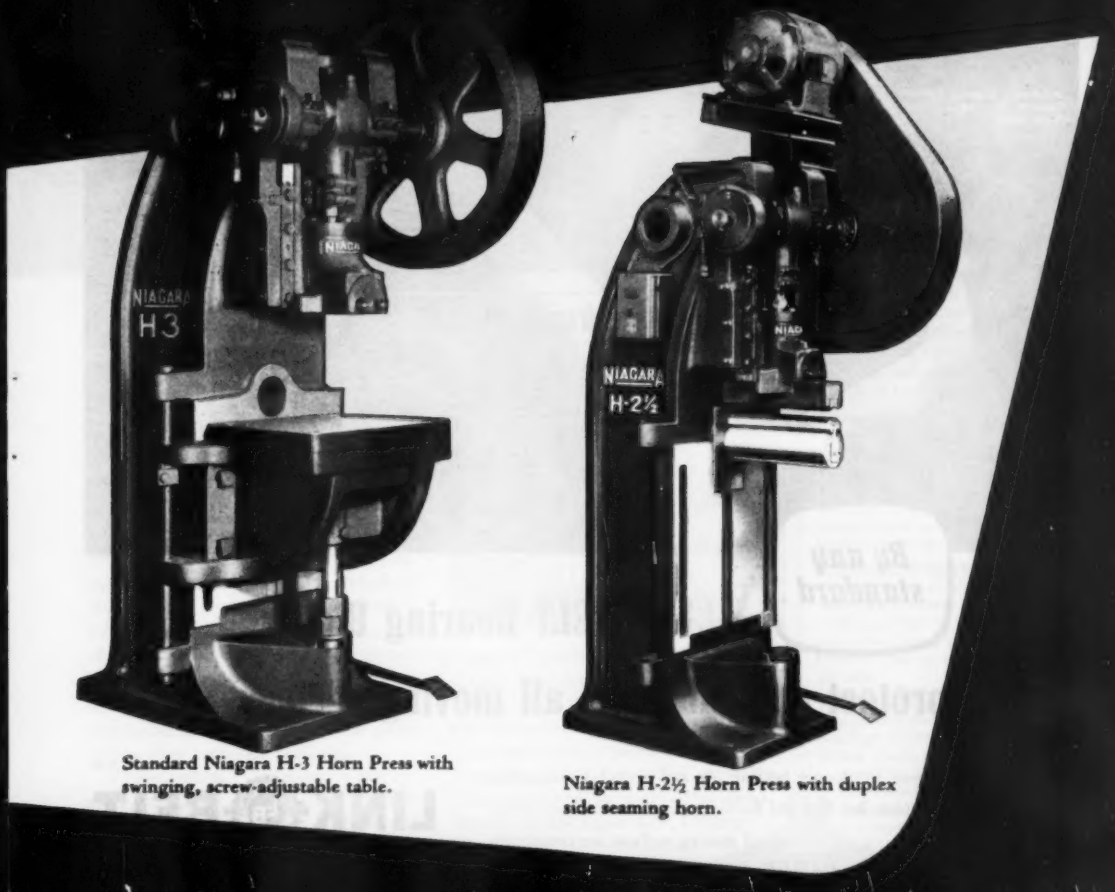
* In addition to ordinary blanking and forming work, these presses can be used for a variety of other operations requiring exceptional die height, such as curling, wiring and flanging container bodies. When fitted with a horn they can perform seaming, piercing, riveting and forming operations on the sides of formed shells.

Write for specifications on sizes to fit your requirements.

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

ADJUSTABLE BED HORN PRESSES

offer Versatility for Defense Production



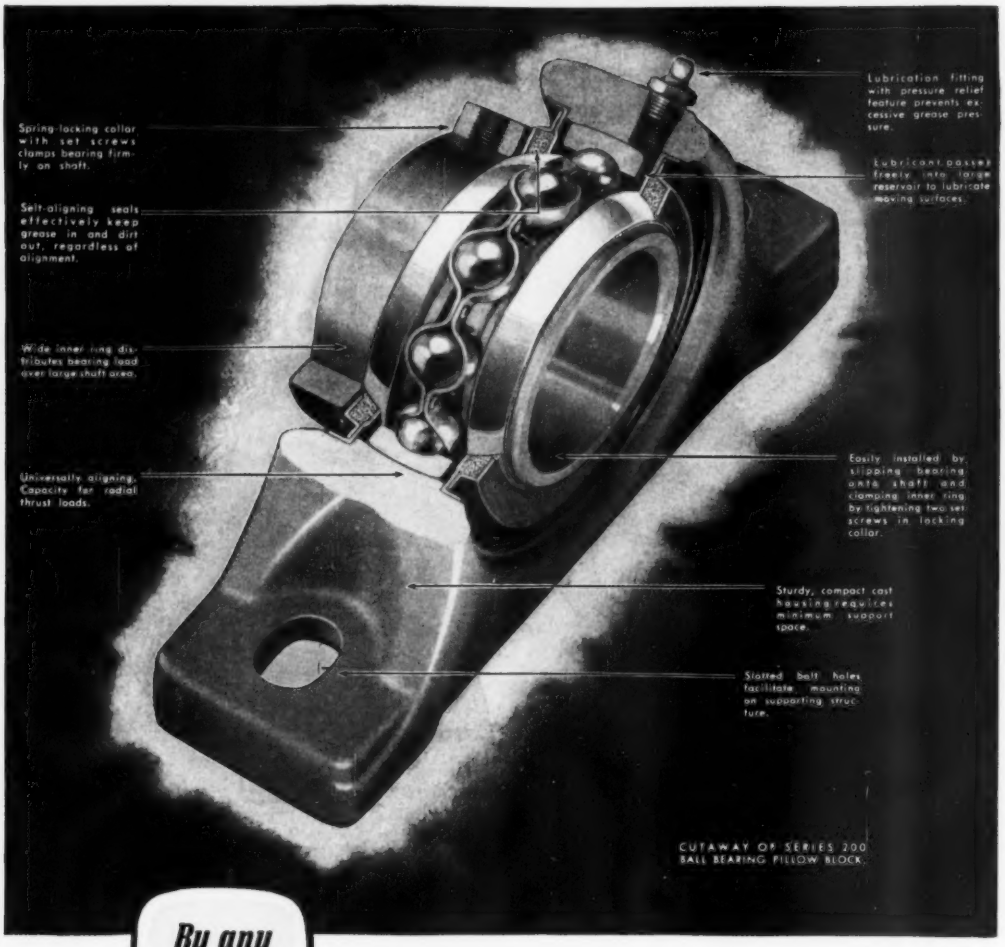
Standard Niagara H-3 Horn Press with swinging, screw-adjustable table.

Niagara H-2½ Horn Press with duplex side seaming horn.

America's Most Complete Line of Presses, Shears, Machines and Tools for Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

LINK-BELT Ball and Roller Bearings smooth the path of power


Lubrication fitting with pressure relief feature prevents excessive grease pressure.
Spring-locking collar with set screws clamps bearing firmly on shaft.
Lubricant passes freely into large reservoir to lubricate moving surfaces.
Self-aligning seals effectively keep grease in and dirt out, regardless of alignment.
Wide inner ring distributes bearing load over large shaft area.
Easily installed by slipping bearing onto shaft and clamping inner ring by tightening two set screws in locking collar.
Universally aligning. Capacity for radial thrust loads.
Sturdy, compact cast housing requires minimum support space.
Slotted bolt holes facilitate mounting on supporting structure.
CUTAWAY OF SERIES 200 BALL BEARING PILLOW BLOCK.

By any standard . . . **LINK-BELT Bearing Blocks protect and lubricate all moving surfaces**

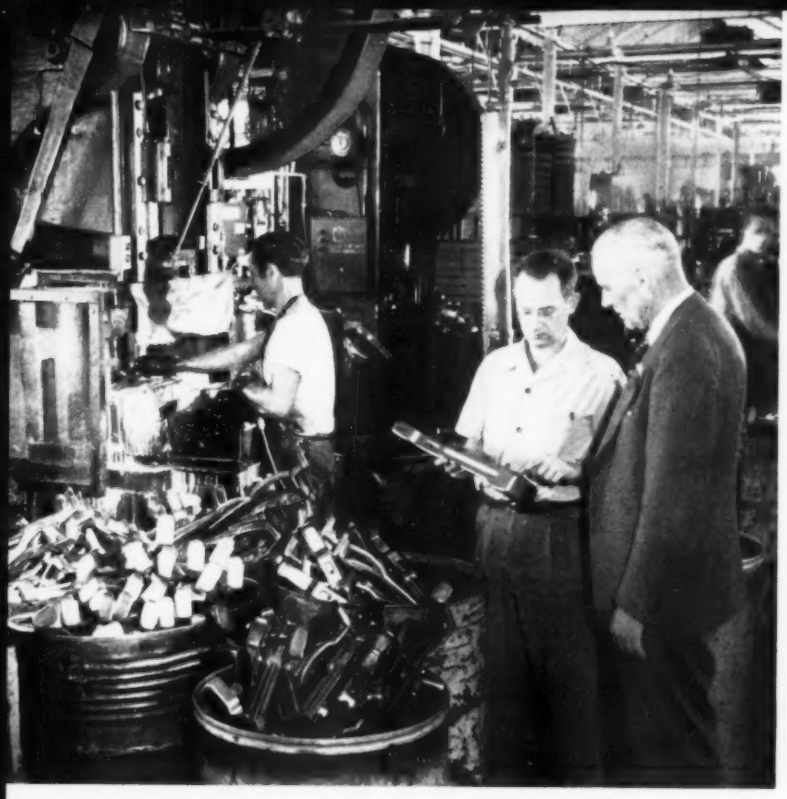
To give you longer bearing life and extended lubricating schedules, Link-Belt Ball and Roller Bearings are Housing-Sealed — all moving surfaces are completely enclosed and centrally lubricated from a large common reservoir. And only from Link-Belt do you get this important advantage on ball as well as roller bearings. There's a Link-Belt Bearing Specialist near you. Or you can get full engineering information in Data Book 2550.

12.283

LINK-BELT

Ball and Roller Bearings

LINK-BELT COMPANY: Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities.



Cuts die polishing, puts more punch into production...

● Operators at Great Lakes Spring Division of Standard Steel Company, Chicago, were running only 5,000 to 10,000 automotive seat cushion track supports on this 200 ton press between shutdowns for polishing of the dies. Appraising the situation, a Standard Oil lubrication specialist recommended STANOSTAMP Compound "C" in place of the oil base compound then in use.

STANOSTAMP's superiority was shown without question when production mounted to 100,000 piece parts before dies required polishing.

These results . . . similar to the results you may expect from STANOSTAMP in your own plant . . . have led to the use of STANOSTAMP in a wide range of punch press work at Great Lakes, replacing a variety of compounds. For the help of a Standard Oil lubrication specialist in solving your own press problem, contact your local Standard Oil office or write: Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.

STANOSTAMP
REG. U. S. PAT. OFF.
Compounds

What's your problem?

A. L. Seabaugh, of Standard's Chicago office, is the lubrication specialist who helped solve this problem through the use of STANOSTAMP Compound. Like other Standard lubrication specialists, he makes his headquarters near the plants he serves and is able to give on-the-job help when it's needed.

Practical experience and extensive special training make up the background for the service these specialists offer. It is available to you, in your plant, wherever you are located in the Midwest. Just call your local Standard Oil office.

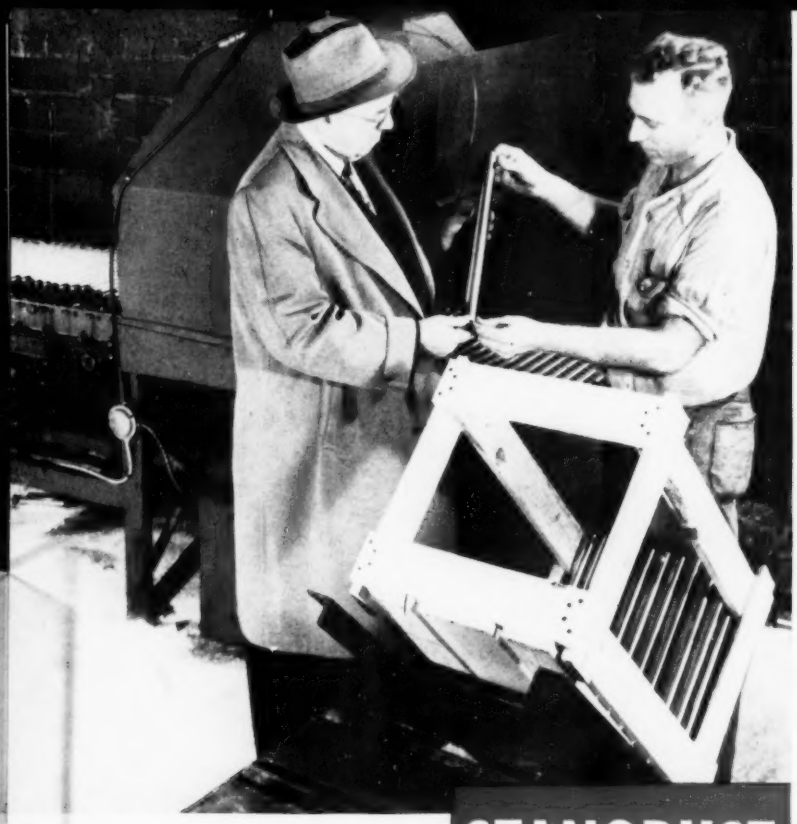
When the lubrication specialist calls, ask about these other fine Standard Oil products:

STANICUT Cutting Oils. These special-duty cutting oils meet today's most exacting requirements and highest production schedules. Grades vary in viscosity and compounding. Each contains the correct proportion of extreme-pressure and friction-reducing ingredients.

STANICOOL HD Soluble Oil. Because of additional compounding, this heavy-duty soluble oil possesses the cooling ability of an emulsion and also gives better tool life and finer finishes than do conventional soluble oils.

STANOLEX Oils. Due to superior wetting ability, these oils are useful on bearings which are inclined to rust during shutdown, or because of high humidity. They are recommended for lubrication of ways and guides on machine tools which are prone to chatter when straight mineral oils are used.

STANDARD OIL COMPANY **STANDARD** *(Indiana)*



STANORUST

REG. U. S. PAT. OFF.

Rust Preventives

A clear case of rust prevention

● Without a protective coating, these ground finish steel tubes showed rust marks even before the customer could assemble them. A heavy black oil type coating proved difficult and messy to apply, resulted in an unattractive product, and called for a cleaning operation on the part of the customer.

That was the situation at Central Steel Tube Co., Clinton, Iowa, when a Standard Oil lubrication specialist recommended STANORUST Rust Preventive No. 4-V. Tested and approved, STANORUST was put to work.

Now, these same parts are easily and automatically sprayed after grinding. STANORUST No. 4-V leaves a slightly oily, transparent coating that shows the ground finish to advantage, yet allows handling of the parts without fear of fingerprint corrosion. Shipped to the customer, they arrive bright and rust-free, ready for assembly without removal of the protective coating.

STANORUST No. 4-V provides exactly the degree of protection required in this case. It is one of eight grades in the STANORUST line . . . one of which is the answer to your own rust prevention problem. For details, call on your Standard lubrication specialist. Contact the Standard Oil Company office in your area, or write:

Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

What's your problem?

E. J. Newel, who makes his headquarters at Standard's Des Moines office, is the lubrication specialist who helped Central Steel Tube Co. put an end to rust prevention problems through the use of STANORUST No. 4-V.

Throughout the Midwest there is a corps of such specially trained, experienced lubrication specialists ready to give you prompt, on-the-spot help with any lubrication problem. Each of these men has been carefully trained in a Standard Oil Lubrication Engineering School to supplement his own background of practical experience. It's easy to get the services of a lubrication specialist—just phone or write to your local Standard Oil Company office. When he stops by to see you, ask him about the following quality Standard products.

STANOIL Industrial Oils—This multi-purpose line of oils provides cleaner operation of hydraulic units, supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

SUPERLA Greases—Available in lime soap and soda soap types, SUPERLA Greases cover a wide range of applications. These products are comparable in quality to the highest type of special greases but are as readily available and economical as ordinary cup greases.

STANDARD OIL COMPANY STANDARD *(Indiana)*

You owe it to yourself to learn more about this remarkable hammer . . .

Write for Bulletin 11-L-O

CECO-DROP

• *The Boardless Gravity Drop Hammer* •

No Boards • No Front Rod • No Back Rod
Costs less to operate . . . Forges more minutes per hour . . . Is safer and easier to operate . . . This hammer is setting new records in cutting forging costs and in increasing production.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

Load Up

Complete Your Union Drawn "Pocket Library" Now!

Here are all six of the popular pocket-sized Union Drawn booklets. They're packed with quick facts . . . informative . . . interesting. Write for your free copies.

for Top Production

with Union Drawn's Better-Than-Ever

MACHINABILITY

TOOLING COMPLETED. Set-ups done. Next —PRODUCTION AND MORE PRODUCTION. Get those parts out—on schedule.

So, load Union Cold Finished Steel Bars. Watch spindles whirl, tools bite deep, cutting oils gush steadily and finished parts thump a tattoo into pans.

That takes MACHINABILITY—the Union Drawn kind that's *uniform* throughout bar after bar and shipment after shipment.

Better and better steel MACHINABILITY has been the 60-year goal at Union Drawn. Today, no one knows more about steel machining than the men who make Union Cold Finished Bars. Year after year, every new bit of knowledge is translated into improved steelmaking and finishing.

Because of such intense concentration on one single goal, today's Union Cold Finished Steels allow you top ratings on feeds and speeds . . . longer tool life with fewer grinds . . . freedom from abrasive elements . . . smooth, bright machined surfaces . . . high production . . . low unit cost.

Need help on any machining or change-over problem? "MACHINABILITY Headquarters" can help you there, too. Union Drawn Field Representatives have prompt solutions to most production problems. They're ready for consultation any time you are. Just write:

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

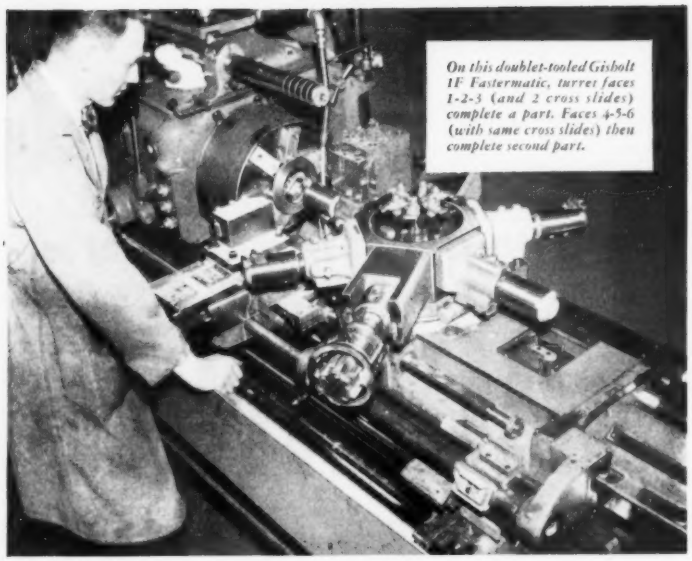
This "X" Steel May Boost Production Even Further

Are your parts and equipment such that you can use higher speeds and longer tool life? Then it will pay you to investigate Union Drawn's extra fast machining Bessemer Screw Steel, B-1113X. Your Union Drawn Field Man will be glad to tell you all about it.

Republic REPUBLIC STEEL UNION COLD DRAWN STEELS

Free-Machining Bessemer, Alloy and Enduro Stainless Steels
•
Union Cold Drawn Special Sections
•
Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting)

HOW DUPLICATE TOOLING... AND A FASTERMATIC...



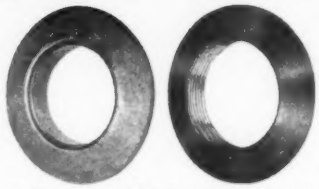
On this doublet-tooled Gisholt 1F Fastermatic, turret faces 1-2-3 (and 2 cross slides) complete a part. Faces 4-5-6 (with same cross slides) then complete second part.

doubled production!

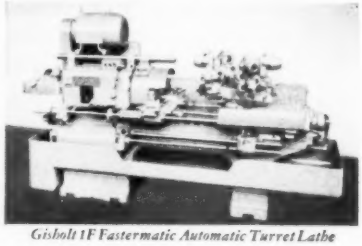
The time *and unit cost* for machining these cast iron pulley flanges were cut in half when the Fastermatic with double tooling took over the job.

Just three turret faces were needed to complete the machining and threading on each part. Therefore, tooling is repeated on the other three turret faces so that *two* parts are finished with each revolution of the turret. Production is doubled over the old method . . . time lag is cut to a minimum . . . there's twice the time between tool changes.

This smart setup illustrates one of the many ways Fastermatic Automatic Turret Lathes give you greater efficiency and lower costs on a broad range of jobs. And one operator can usually handle two or more machines. Ask for the facts.



Floor-to-floor time for these pulley flanges is down to 1.75 minutes. Duplicate tools and collapsing taps on the turret rough and finish the bore, chamfer and cut threads. Front and rear slides shave the angle and form the radius on the O.D.

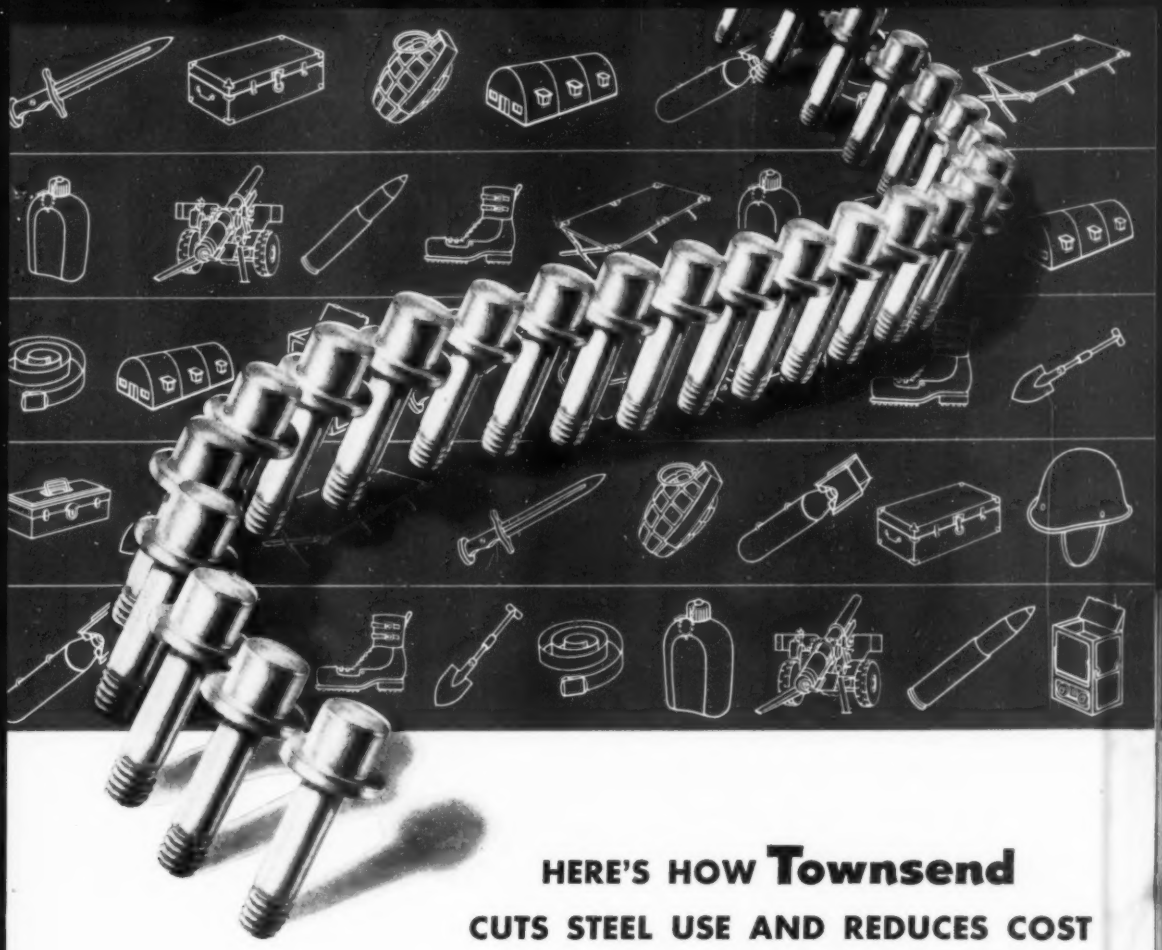


Gisholt 1F Fastermatic Automatic Turret Lathe

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



HERE'S HOW Townsend CUTS STEEL USE AND REDUCES COST ON THIS DEFENSE ITEM

The part shown above for use in a smokeless powder box was originally made from bar stock which wasted hundreds of tons of critical steel. Townsend engineers suggested that by a slight change in design the part could be cold headed from wire thus saving considerable steel and reducing the cost greatly. We are not permitted to reveal the number of parts made, but the aggregate savings both in money and steel was substantial.

This is typical of how Townsend saves time, money and material for customers by drawing upon its long experience in cold-heading to produce quality parts and fasteners with economy. When you work with Townsend in designing and producing military or civilian items you enjoy the benefit of this experience.

Townsend products for defense range from hob nails for field boots to rivets for half tracks — from special nails for gliders to artillery firing pins — even balls for canisters.

To learn more about the savings in time, money and critical materials that are possible when you have Townsend design and produce your small parts and fasteners, write or phone today.

Townsend

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Sales Offices in Principal Cities

Van Keuren GAGE BLOCKS for every REQUIREMENT

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PUT ACCURACY AT THE MACHINE

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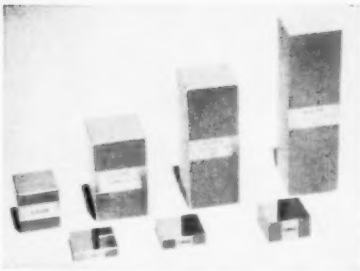
SETS FROM $15.00 - $125.00



VK SOLID SQUARE MASTERS

The 30 year blocks

5 year guarantee

LABORATORY USE OR TO STANDARDIZE ALL PLANT DIMENSIONS

.000004" ACCURACY

VK RECTANGULAR BLOCKS

SETS FROM $375.00 - $750.00

For Inspection Department

or precision set-up

.000008" ACCURACY

SETS FROM $140.00 - $325.00

Catalog and Handbook No. 34. This 208 page volume represents 32 years of experience and 2 years of research sponsored by The Van Keuren Company. It presents for the first time in history a simple and exact method of measuring screws and worms with wires. Tells how to measure gears, splines, and involute serrations. An accepted reference book for measuring problems and methods. *Copies free upon request.*

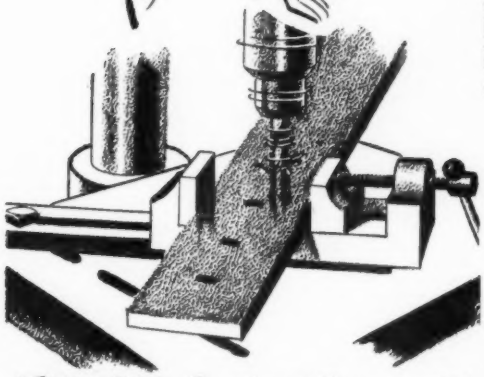
THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

32nd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

DRILLING POINTERS..... by Red Shield

ABRASION. 11/16" taper shank drills on cast iron valve job were wearing due to abrasion. Changed surface heat treatment to suit their problem. Drill life increased beyond all expectations.



STAINLESS. Regular drills averaged 3 holes per grind in tough work-hardening stainless steel. We suggested No. 506 F Fast Spiral Drill with special heat treatment and point. . . .Now get more than 90 holes per grind.

SERVICE. 70 years' experience behind our Red Shield Service Staff...to help solve your metal cutting problems. Get in touch with your local Standard Tool Co. distributor.

STANDARD TOOL CO. DEPT. 1-A, 3950 CHESTER AVENUE CLEVELAND 14, OHIO

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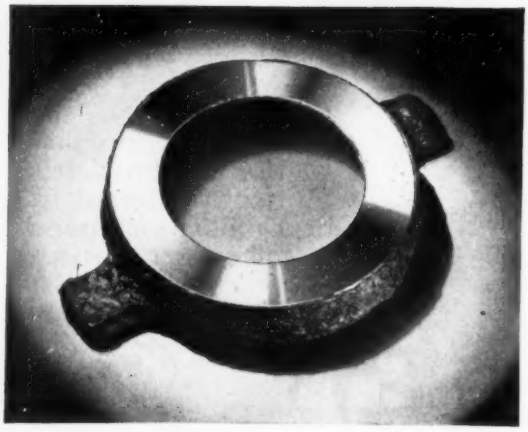
THE STANDARD LINE: *Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools*

NOT WANTED



X-RAY

Good only for scrap. That's the fate of an imperfect casting. No one wants it, but *someone has to pay* once expensive machining has been started.

That's why leaders in industry are placing confidence in radiography. A vital inspection tool for detecting internal discontinuities prior to finishing operations. Before the ledger grows red with costly machining.

As an inspection device, industrial x-ray is often a non-destructive substitute for physical test and sectioning. But its applications are far broader. In fact, industrial x-ray has become a *development* tool. An instrument that not only diagnoses, but suggests treatment as well. It shows where savings can be made, designs improved.

Write for booklet "Industrial Application of the X-Ray". X-Ray Department, General Electric Company, Room AB-10, Milwaukee 14, Wisconsin.

GENERAL ELECTRIC

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Fresh-roasted Chisels Halt Costly Breakage

A foundry in the Middle West had long depended on a rule-of-thumb heat-treater to harden the large number of chisels they used daily. One day he quit abruptly. No great concern was felt about his departure—until they began to break as many as 300 chisels in one day.

A trouble-shooter, hurriedly summoned, soon traced the appalling breakage to the as-quenched brittleness of the chisels. The departed heat-treater hadn't revealed how he relieved this condition.

The trouble-shooter went on to explain that the chisels had to be tempered after hardening. But there was no suitable heat-treating equipment in the foundry. Suddenly he hit on the answer. "Tell you what—you can get one of those electric turkey roasters. They cost only about twenty-five bucks and they'll give you a tempering range of about 250 to 500 F. Just what you need."

The division foreman was dubious. How could roasting the chisels do any good? But he bought a roaster and put it on the job. To his surprise it cured the breakage. In the first week they averaged only one broken chisel a day. The roaster paid for itself in no time.

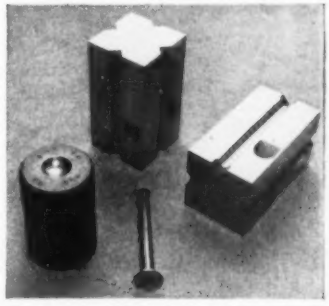
Many tools and dies fail because they haven't been tempered after hardening. Not holding tools at the tempering temperature long enough causes the same sort of trouble. Another important point: always temper tools before they cool down to room temperature. Usually it's best not to let them cool below 150 F.

Cold-heading Die Steel Takes a Real Beating

Maybe you've seen a cold-heading machine in action, forging bolts, rivets, screws, and other products at high speed. The tools and dies which do the cutting, gripping, and heading have to be seen at work to be appreciated. Minute after minute, day after day, they withstand continuous terrific pounding.

Good cold-heading die steel—used for the solid, open, and header types of dies—must have a hard, long-wearing surface, reinforced by a tough core. The hard, wear-resisting case must be deep enough to prevent sinking or upsetting and tough enough to absorb heavy pounding without chipping or spalling.

Cold-heading die steel is one of our special-purpose tool steels. It took quite a few years to work out the right carbon content, depth of hardness, and grain size. For example, we've found that a shallow-hardening steel is best for header dies up to 2-in. diameter; for larger dies a deep-hardening steel gives longer service. Both are fine-grained tool steels, made ever so carefully to insure the ultimate in cleanliness and freedom from injurious defects.



These gripper and header dies of Bethlehem Cold-Heading Die Steel have the ideal combination of hard surface and tough core for cold-heading thousands of bolts each day.

We call it Bethlehem XX Cold-Heading Die Steel. It's really tops for this kind of punishing service. Like to know more about it? Address your request to our Publications Department, Bethlehem, Pa. Ask for Booklet 261.

Our Tool Steel Engineer Says:

A modified oil-quench gets rid of scale on air-hardening tool steels

Some toolmakers object to air-hardening steels because a thin, adherent scale may form during the air-quench. Avoiding this scale is really easy.

Quench the tool or die in oil until it just loses color . . . 900 to 1000 F . . . then cool it in air to about 150 F, followed by the usual tempering operation. The oil-quench will "throw" the scale. But the tool won't crack, because air-hardening steels do not begin to transform, or harden, until they reach 400 F or less.

However, air-hardening steels must *not* be quenched in oil long enough to cool them down below the temperature at which transformation takes place. If this precaution is ignored, cracking of the tool is likely to result.

Air-quenching, of course, results in the minimum amount of distortion.

Bethlehem ULTRASONIC TESTED **Tool Steel**

PRATT & WHITNEY

SCREW MACHINE CUTTING TOOLS

BRING *UNIFORM* QUALITY AND *DEPENDABLE* ACCURACY TO THE PRODUCTION LINE

DUOCOME DIES AND HOLDERS

ADJUSTABLE ROUND SPLIT DIES AND DIE HOLDERS

P&W T-CUT BLADES AND JOHNSON'S CUTTING-OFF TOOLS

SCREW SLOTTING CUTTERS

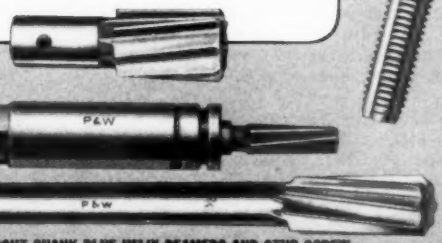
SCREW MACHINE KNURLING TOOLS

Through correct design, precise metallurgical control and high standards of manufacture and inspection, you obtain . . .

- ✓ EFFICIENT CUTTING ACTION
- ✓ TROUBLE-FREE PERFORMANCE
- ✓ REDUCED WORK SPOILAGE
- ✓ EXTENDED TOOL LIFE

MODIFIED SPIRAL POINT BOTTOMING TAP

HIGH SPEED STEEL GROUND THREAD TAPS



STRAIGHT SHANK BLUE HELIX REAMERS AND STUB SCREW MACHINE REAMERS WITH FULL FLOATING HOLDERS

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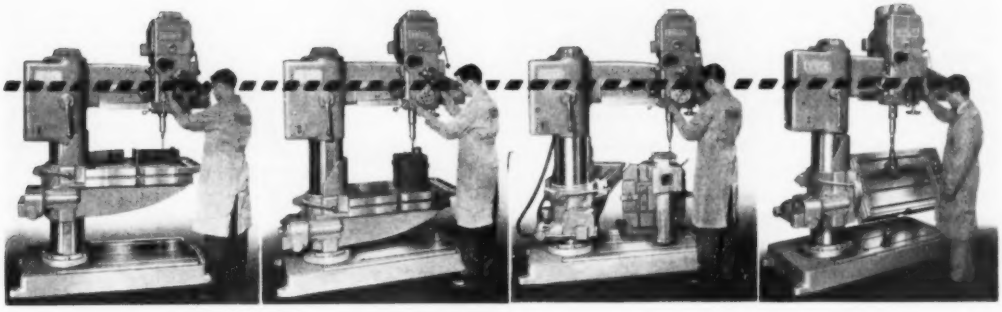
no reaching....
or crouching....
for any job....



WITH A FOSDICK SENSITIVE RADIAL DRILL

You can drill holes up to 1½", in small or large work—*all from the same normal operating position* on this unique machine.

The Fosdick Sensitive Radial Drill is another in a long line of Fosdick "firsts." It fills the gap between the Radial and Sensitive or Upright Drill, gives you exceptional versatility, *plus* operator convenience never possible before.

The arm of this machine—always at the same height—swings 360°. The table, which moves up and down on the one-piece column, also swings 360°. It may be provided with the tilting feature illustrated. A machine base is provided for work too large for the clearance between spindle and table.

Get the whole story on this unique machine. Its moderate price and outstanding features will mean more profitable drilling in your shop. Call your Fosdick Distributor today or write for Bulletin SRA.

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

RADIAL DRILLS
SENSITIVE AND UPRIGHT DRILLS
JIG BORERS
AUTOMATIC POSITIONING MACHINES
SENSITIVE RADIAL DRILLS

FOSDICK

M.T.

When Does a Band Saw Become a Machine Tool?

There are basic requirements of accuracy and proficiency that separate a "machine tool" from other power tools . . . characteristics such as those which distinguish a tool maker's screw-cutting, precision lathe from the woodworking lathes used in grade school manual training classes. Among metal-cutting band saws, only the MARVEL No. 8 Series Band Saws can qualify as *machine tools*, for only MARVEL Band Saws have the following capabilities and features:

1 Angular cutting from 0° to 45° right or left *without* moving the work. Built-in protractor.

2 Vertical blade power-fed into material—permits re-entrant cuts, notching, mitering, keyway sawing, etc.

3 Automatic power or manual feeds at the flick of a finger.

4 Feed pressure adjustable even when machine is running. Indicated in actual pounds of pressure.

5 Work clamped to table of machine. Working area more than 835 square inches.

6 Tee-slotted table facilitating clamping down of odd and irregular shaped pieces; easily supports heavy work or large and long structural shapes. Standard vise chucks work on either side of blade.

7 Automatic blade tensioning device. Every blade at uniform tension regardless of operating efficiency.

8 Adjustable upper guide roller holder insuring minimum section of unsupported blade on all sizes of material. Quick acting.

9 Built-in coolant system with delivery at blade entry point. Pump driven without belt or gears.

10 Replaceable vise ratchet and table wear strips of tool steel. New saw performance at all times.

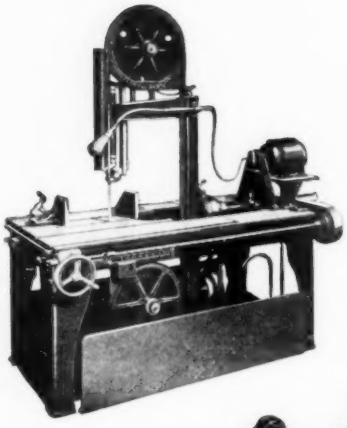
11 Large CAPACITY: Standard: 19½"x18¾". High column: 25½"x18¾". Handles 99% of all work.

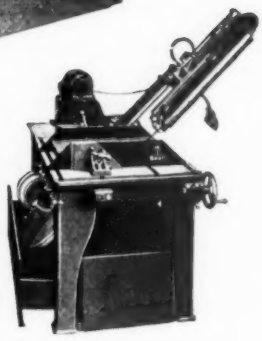
Before buying any metal-cutting band saw, be sure to see the versatile MARVEL No. 8. Your local MARVEL Field Engineer will demonstrate its significant "machine tool" characteristics and their application to your work, with costs, savings, cutting speeds and methods. This technical service is provided, without obligation, in the interests of better metal sawing.

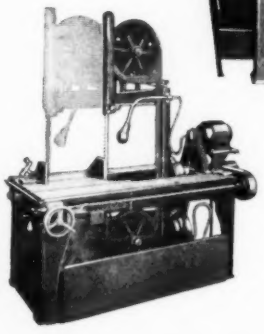
If you prefer to "study it out for yourself," write for the MARVEL C-49 Catalog.

ARMSTRONG-BLUM MFG. CO.
5700 Bloomingdale Ave. Chicago, USA

MARVEL *Metal Cutting* SAWS
Better Machines—Better Blades







Schrader Valves— Practical answers to air control problems

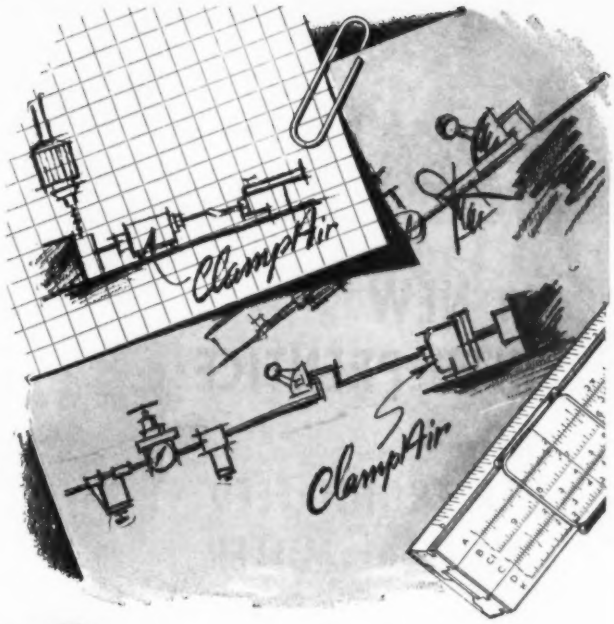
Three Way Valve—This inexpensive valve will give long service and is designed to operate small bore single acting cylinders such as the Schrader ClampAir. The stainless steel lever is functionally designed for positive stops and facilitates comfortable hand operation. A small hole in the lever provides means for mechanical operation if desired.

Valves With Hand Lever (Two, Three and Four-Way Types) Durability and simplicity of construction feature these forged brass valves which are designed for easy hand operation. One hardened steel bolt holds the two-piece body and internal parts in place and contributes to time-saving, low-cost maintenance.

Valves With Mechanical Lever (Two, Three and Four-Way Types) This type valve is similar to the one described above but has a lever arranged for mechanical actuation to provide automatic operation. The rugged steel lever will stand up under rapid actuation over long periods of use.

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings

Schrader
PRODUCTS
CONTROL THE AIR



ClampAIR cylinders can simplify any work holding operation

You can eliminate the tiring muscular work of setting mechanical clamps, as well as reduce the time for clamping with the new Schrader ClampAir.

It is actually a bantam-size air cylinder, with sufficient power to hold the work firmly in place for as long as you want... with the same force every time. Once you start using the Schrader ClampAir for your holding operations, not only will your productions be increased but rejects will be fewer.

Various types of machines, such as Drill Presses, Milling Machines, Gluing Devices and many others, are natural locations for Schrader ClampAirs. Moreover, since they are basically push type cylinders, they can be used in many mechanisms to furnish a short, sturdy push stroke. They are available in either end or side mounting, and a variety of bore diameters and stroke lengths.

Look over your shop and note the many places where Schrader ClampAirs will help you do jobs faster and safer—without fatigue...or, submit your problem to us. We will be glad to help you determine what will best fit your needs. Send us a letter outlining your particular installation, your idea, or fill out the coupon below.

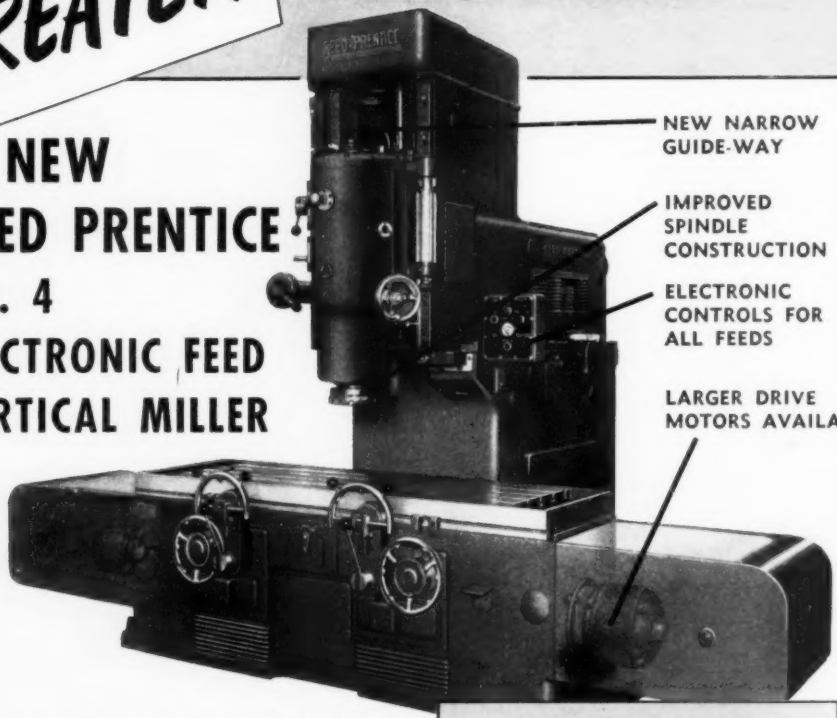
Mail this Coupon Today

A. Schrader's Son
Division of Scovill Manufacturing Company, Incorporated
460 Vanderbilt Avenue, Brooklyn, N. Y., Dept. F-5
Please send me further information on the Schrader ClampAir and valves.

Name _____ Title _____
Company _____
Address _____
City _____ Zone _____ State _____

GREATER VERSATILITY

in NEW REED PRENTICE NO. 4 ELECTRONIC FEED VERTICAL MILLER



● The Reed-Prentice No. 4 Vertical Miller now offers even greater advantages in performing heavy-duty milling and die sinking jobs. Improved spindle construction features radial and thrust load SKF bearings which make possible use of larger drive motors to attain spindle speeds of 1800 RPM. In addition, the No. 4 Miller contains a master control station providing electronic feed drive for table, cross slide and vertical slide (spindle head).

Send today for catalog 21 describing all Reed-Prentice Milling Machines and Lathes.

SPECIFICATIONS:

Machine Size	48"	60"
Longitudinal travel of table	48"	60"
Travel of cross slide	24"	24"
Table Working surface	24" x 84"	24" x 96"
Rapid traverse (Table)	180"/min.	180"/min.
Table to spindle nose, max.	24"	24"
Feeds (Electronically Controlled)	Infinitely variable	
Spindle speed range		
10 H.P. —	30-1200 RPM	30-1200 RPM
20 H.P. —	45-1800 RPM	45-1800 RPM
30 H.P. —	90-1800 RPM	90-1800 RPM
Machine Weight (lbs.)	20,500	24,000

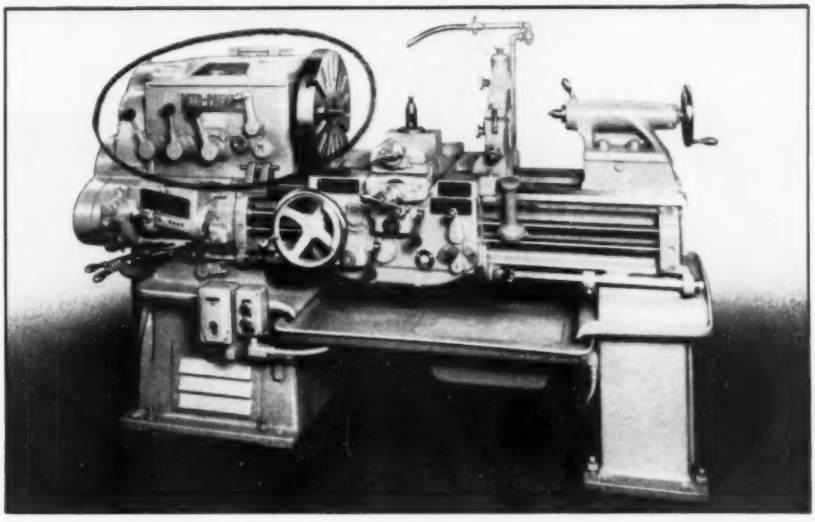
MACHINE TOOLS
REED-PRENTICE CORP.
WORCESTER MASS., U.S.A.

MAIN OFFICE: 677 Cambridge St., Worcester 4, Mass.

Higher SPINDLE SPEEDS

on NEW REED-PRENTICE LATHES

GOOD DELIVERY ON ALL SIZES



● Redesigned headstock on Reed-Prentice Sliding Gear Head Lathes provides spindle speeds up to 1200 RPM on 14" and 16" Engine and Toolroom models. This new design permits heavier cuts and faster turning on many lathe operations.

Reed-Prentice Lathes are built to the highest precision standards to give trouble-free, accurate performance year after year. Whatever your requirements within the range of swings, it will pay you to investigate the Reed-Prentice line.

SPECIFICATIONS:	14" AA	14" B	16" AA	16" B	20" A
Swing over ways	16½"	16½"	18½"	18½"	21½"
Distance between centers	30"	30"	30"	30"	54"
Spindle speeds, 16 sp.	27-1200 RPM	27-1200 RPM	27-1200 RPM	27-1200 RPM	12-530 RPM
Spindle speeds, 8 sp.	49-1200 RPM	49-1200 RPM	49-1200 RPM	49-1200 RPM	12-405 RPM
Feed and thread changes	49	49	49	49	41
Range of feeds	.0025"-.160"	.0025"-.160"	.0025"-.160"	.0025"-.160"	.0025"-.080"
Range of threads	1½-96	1½-96	1½-96	1½-96	3-96

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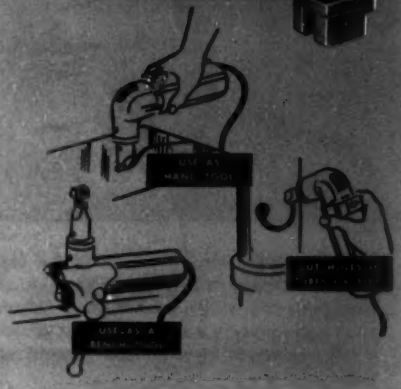
PORTABLE!
ACCURATE!
VERSATILE!

Ideal for BIG or SMALL SHOPS



THE NEW PORTABLE "LITTLE WONDER" NIBBLER

Here is the solution to many problems . . . whether your shop is large or small. The Fenway portable "Little Wonder Nibbler" will do your complete range of jobs. It is light weight and portable.

"The Little Wonder Nibbler" is powerful . . . and accurate. It cuts up to 14 gauge steel without distortion. It cuts holes in tubes and ducts where it is necessary to retain the original contour. It is equipped with 10 feet 3 conductor rubber cord with connections, 1 extra punch and die, necessary wrenches.

FEATURES:

Capacity: 14 Gauge C R Steel or Galvanized Iron . . . 16 Gauge Stainless Steel . . . softer material in proportion.

Minimum Cutting Radius: 7/8".

Motor: Universal for either DC or AC 115 Volt up to 60 cycle.

Frame: Cast aluminum for lighter weight, greater strength.

Bearings: Antifriction Bearing on all rotating parts.

Gearing: Hardened precision cut Gears.

Overall Length: 10" . . . net weight, 7 lbs.

Guaranteed against defect in materials or workmanship. We invite your inquiries today.

DISTRIBUTOR TERRITORIES OPEN

Distributor territories are now available. Your letter will receive prompt attention, and full details will be forwarded.

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The Hydraulic "Package" of a THOUSAND USES

VICKERS POWER PACK

Simplifies Hydraulic Design

•

Saves Money, Space and Time

These three applications of the Vickers Power Pack indicate something of the extremely wide usage range of this hydraulic package.

Manufacturers have found it ideally suited to the largest variety of mobile as well as many stationary installations. It provides a compact, self-contained hydraulic system which is quickly and easily installed at low cost. Pump, relief valve, operating valves, oil tank and oil filter are all contained in the rugged, compact unit.

Vickers Power Pack is used on planters, cultivators, plows, stackers, loaders, harvesters, rakes, mowers, dump hoists, lifting tailgates, light duty scrapers, fork lift trucks, loaders, scoops, snow plows, etc. Check into its advantages for your accessory power source.

WRITE FOR BULLETIN 46-48

VICKERS Incorporated

DIVISION OF THE SPERRY CORPORATION

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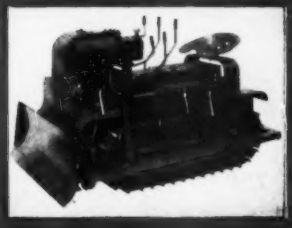
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

4434

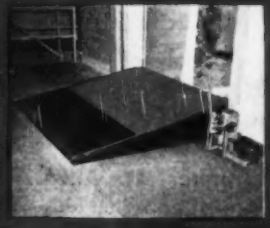
OLIVER COMBINE

Vickers Hydraulic Power Pack provides fingertip, instant control of the twin-cylinder harvester control.



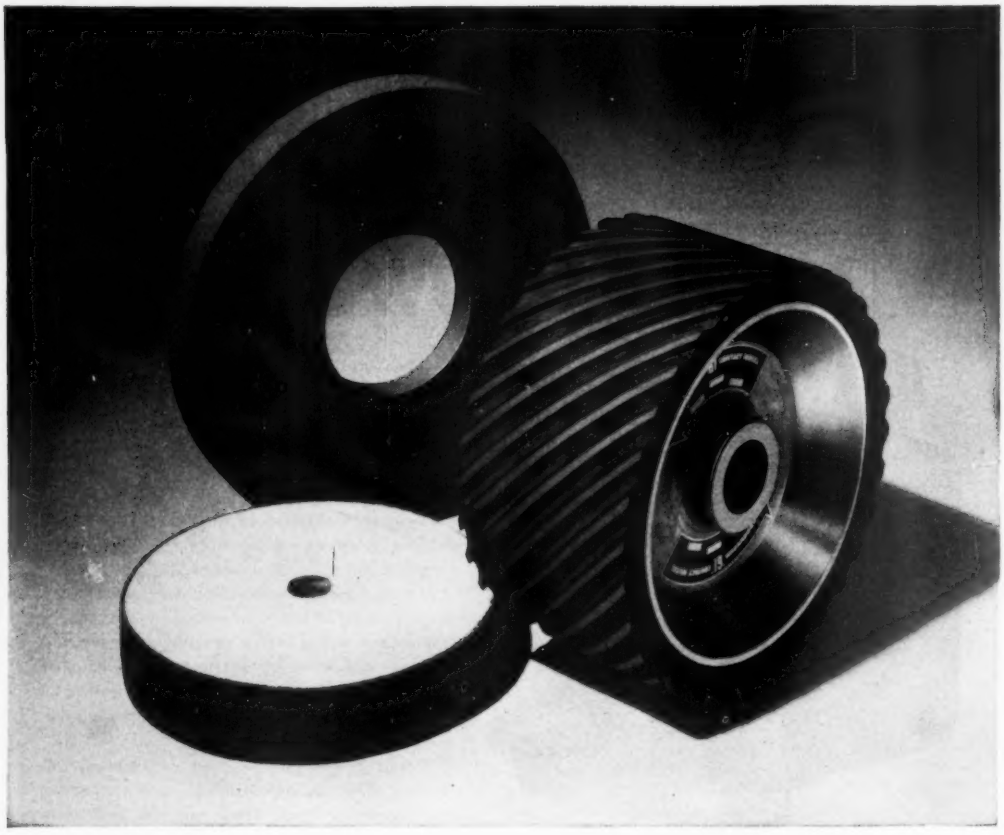
WILLCO J-7 CRAWLER TRACTOR

This powerful little general purpose tractor uses Vickers Hydraulic Power Pack for fingertip control of bull-dozer blade (46" wide x 18" deep) and other attachments.



BEACON DOCK RAMP

Vickers Hydraulic Power Pack powers vertical movement (24") to level with truck or freight car floors . . . also horizontal movement (14") where outer doors must seal when board not in use.



Too many wheels?

Not when each wheel represents a basic method of abrasive application. The "61" Contact wheel is used with an abrasive belt. The Set-up wheel, with grain applied to its periphery, is ideal for many types of polishing. The grinding wheel is perhaps most familiar.

Each wheel is specially designed to perform a specific job better, faster and at less cost. *All* of these are available from one source... CARBORUNDUM. For, only CARBORUNDUM makes all abrasive products, from which you can select those best suited to your operations.

That's why more concerns are looking to CARBORUNDUM for the right answer to every abrasive need. Next time... call in CARBORUNDUM... and be sure.

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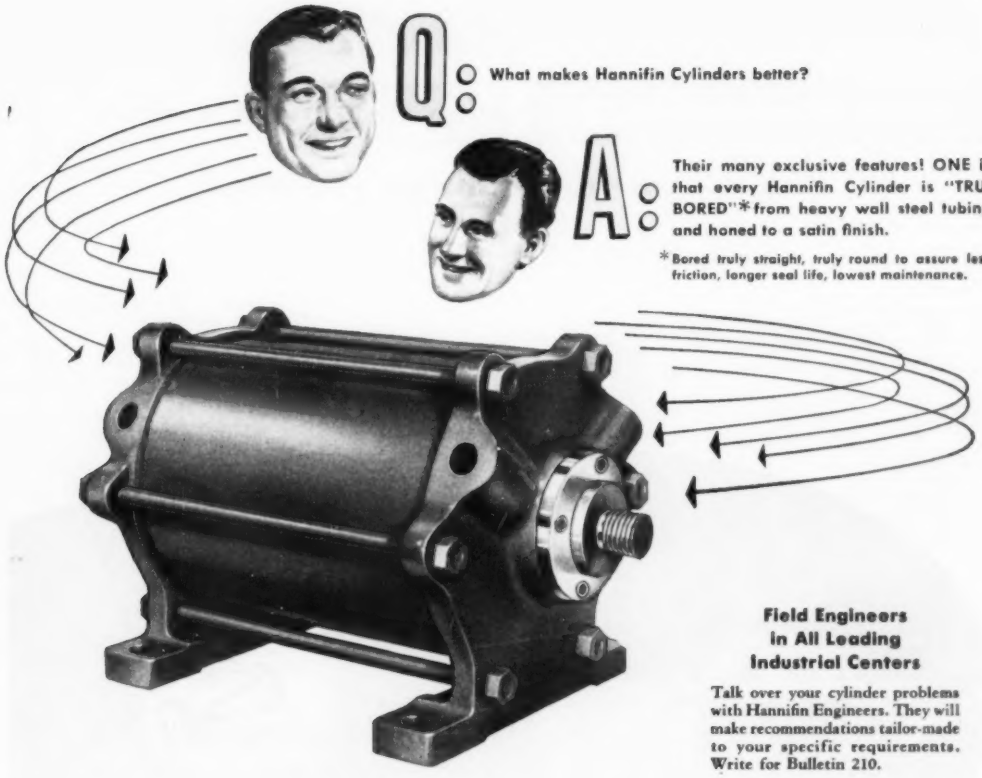

Q. What makes Hannifin Cylinders better?

A. Their many exclusive features! ONE is that every Hannifin Cylinder is "TRU-BORED"* from heavy wall steel tubing and honed to a satin finish.

*Bored truly straight, truly round to assure less friction, longer seal life, lowest maintenance.

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Talk over your cylinder problems with Hannifin Engineers. They will make recommendations tailor-made to your specific requirements. Write for Bulletin 210.

If you check on each operation in the manufacture of hydraulic and pneumatic cylinders, you will know why Hannifin precision methods are superior. Cylinder bodies are piloted into end caps for permanent concentricity of parts; complete standardization is maintained for maximum interchangeability; all cylinders are identified with individual serial numbers registered for life in factory records—it is this careful workmanship and attention to detail that assure maximum utility and minimum "down time" when you specify HANNIFIN CYLINDERS. Hannifin Corporation, 1117 S. Kilbourn Ave., Chicago 24, Ill.

THERE IS A HANNIFIN ANSWER TO EVERY HYDRAULIC AND PNEUMATIC CYLINDER NEED

do All you can do . . . with

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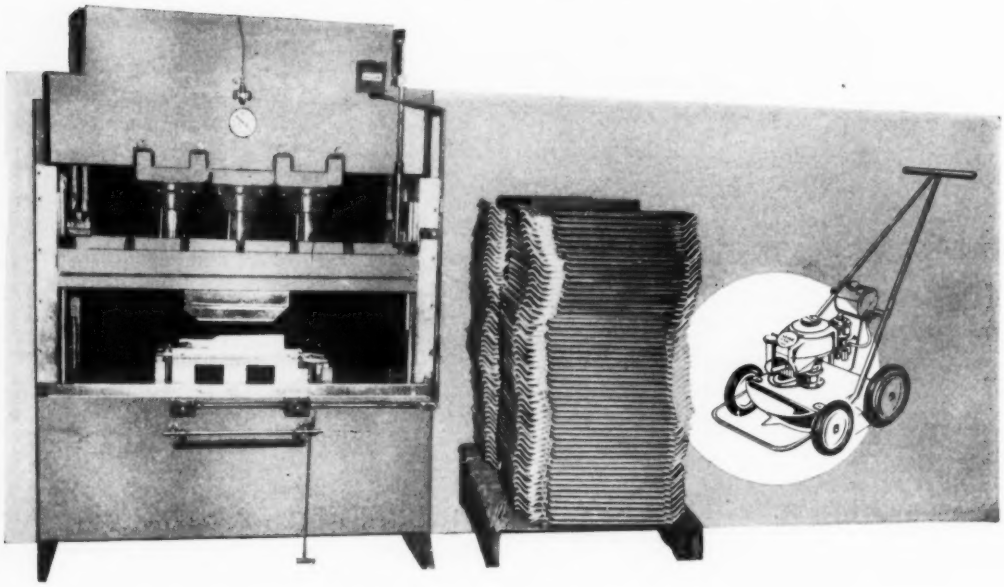
WORTHINGTON MOWER ***trims costs by forming***

deck plate frames in one operation

on K·R·WILSON press . . . . . .



The KRW 150 ton 3-cylinder hydraulic press, shown above, is set up to form *in one operation* the aluminum deck plate frames for Worthington's popular 18" Rotary Mower. The press is also used for forming sheet metal parts on larger Worthington Models 48 and 62. Officials of the company tell us "this press has been in constant use for nearly three years, both day and night shifts, on the blanking, piercing and forming of many of the larger parts going into our line of mowing equipment". There's proof of the versatility and rugged service you get with KRW Hydraulic presses.

Need hydraulic presses in your business? KRW has a full line available *for immediate delivery* in 25-150 ton capacities; one, two and three cylinder types; either hand operated, air operated or motor driven. You'll find that KRW hydraulic presses are the lowest priced on the market . . . and they do the Biggest day's work!

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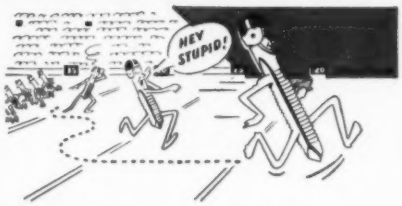
Ask your Machinery dealer to quote prices or write or wire Dep't II

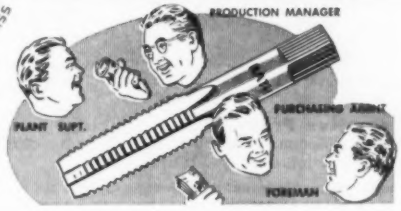


Spiral Point "U" put its team on the field
Determined its honor, never to yield.
But alas — a dull fullback "clogged" the next play —
He made a T.D. — but ran the wrong way!

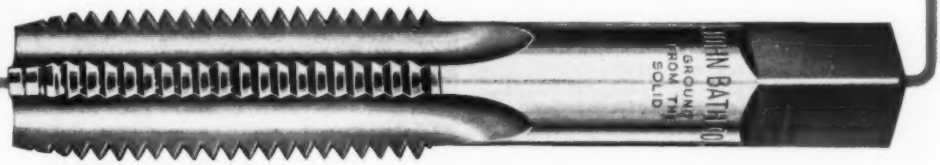
The Bath Tech "back" in a "T" formation —
"Tapped through center" to create a sensation.
Without any "roughness" — he went through a hole
Swiftly "threading" his way to the Spiral Point goal.

JOHN BATH CO. INC. WORCESTER, MASS.

Bath Taps are built for high speed and wear.
In a tight spot, the quality's there.
They'll thread many a "pass", true and complete —
With a clean-cut precision, that cannot be beat.



"Ground from the solid" so sharp and strong,
Whatever you "Tackle", you'll never go wrong.
Insist on Bath Taps and you'll find it's true —
They'll earn T.D's. (Tap Dollars) for you!



INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

A tap, like any other cutting tool, becomes dull with use. A dull tap operates under a severe strain, generates friction and not only produces rough, inferior threads, but is subject to easy breakage.

Sharpen Bath ground thread taps in the flutes as well as on the chamfer, removing only a small amount of material. This will result in more uniform size holes and better quality threads.

"Hold that production line" by insisting on Bath Taps . . . no need for "subs on the bench" with this famous line of outstanding stars with the T.D. (Tap Dollar) reputations.

Just "give us the signal" and we'll be glad to help you with your threading problems.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED
22 Grafton St., Worcester, Mass.

New accomplishments with Johnson's wax drawing compounds!

Aircraft Plants—Johnson's #150 Wax Lubricant successfully used in first stretch forming operation ever tried on Titanium sheet.

50% production time cut claimed on wire brush polishing of stainless steel metallic arc welds with Johnson's #111 Wax Lubricant.

Aircraft engine manufacturer reports outstanding success using Johnson's #150 Wax Lubricant forming Nimonic #75 sheet on Cincinnati Hydroform press.

Automotive Plants—Chicago firm advises drawing former troublesome annealed sheet without annealing through use of Johnson's #150 Wax Lubricant.

Michigan plant of large automotive parts supplier applying Johnson's #150 Wax Lubricant to more and more press operations due to successful experience on tough draws.

General Industry—Outstanding success reported by New Hampshire firm using Johnson's #111 Wax Lubricant for impact extrusion.

"Better finish on drawn parts . . . never seen anything that works as well tapping die castings as your wax lubricants," says Pennsylvania machine shop foreman.

For complete information on the use of Johnson's Wax Lubricants for deep drawing, tube drawing, cold heading, tapping, drilling, routing, sawing, piercing and blanking, bending, stretch forming, etc., *write*—

S. C. JOHNSON & SON, INC.

Industrial Products Dept. AM 10

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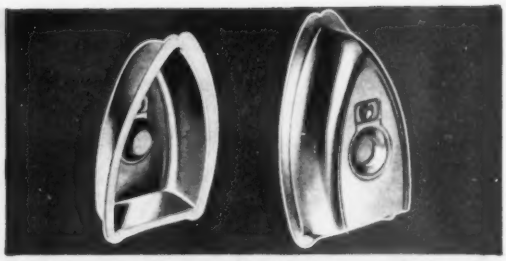
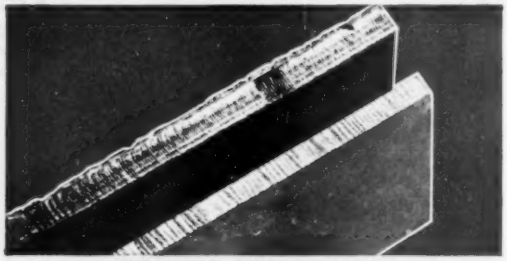
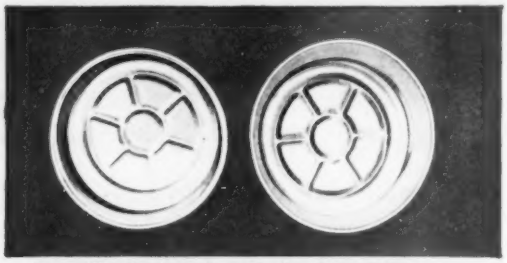


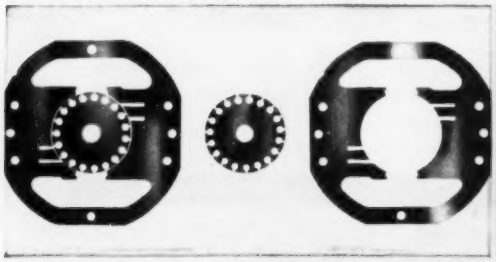
Part for steam iron drawn from #430 stainless steel with 300 ton hydraulic press. Use of Johnson's #150 Wax Lubricant eliminated shutdowns and permitted redesign of die to make draw in one operation instead of three steps formerly required.



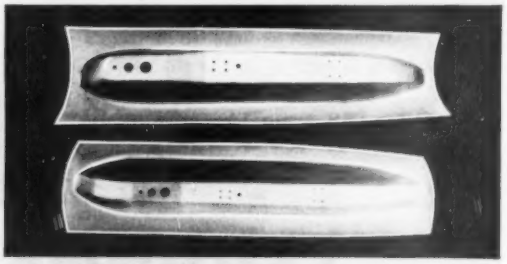
75 ST aluminum pieces cut with Onsrud high speed radial arm router. Conventional lubricant gave 3 cuts per tool—left heavy burr (top view). Johnson's #170 Wax Coolant gave 11 cuts per tool—left no burr—required 50% less pulling effort (bottom view).



Ammunition Powder tank part of .081 gage—3 S O Aluminum drawn and swaged on automatic swaging die. Johnson's #150 Wax Lubricant applied prior to initial draw provides sufficient lubrication for swaging operation.

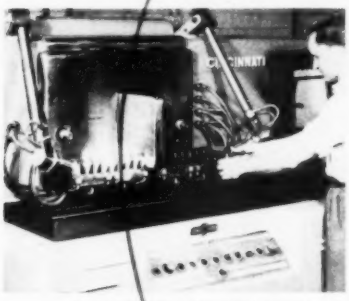


Motor lamination set stamped from electrical sheet. Normal run per die grind—45,000 sets maximum using conventional lubricant. Increased run per die grind to 65,000 sets using Johnson's Wax Lubricant.

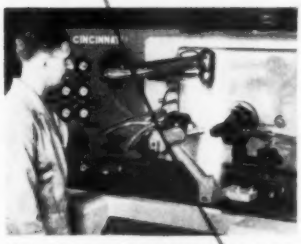


Well jettison fuel tank part of .125 gage—61 S O Aluminum formed on hammer die with Johnson's #150 Wax Lubricant providing lubrication. Aircraft firm unable to produce this part satisfactorily prior to use of Johnson's #150 Wax Lubricant.

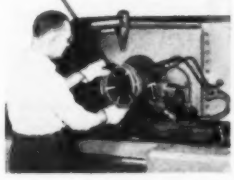
1950 Metal Show, Chicago: transmission hubs



1949 Metal Show, Cleveland: wrench jaws



1948 Metal Show, Philadelphia: drive shafts



1947 Metal Show, Chicago: ring gears

for the fifth consecutive year

Five years ago Flamatic selective surface hardening was demonstrated for the first time—in production—at the Metal Show in Chicago and made front-page news as an important new tool for industry. At each succeeding Metal Show, Flamatic was shown in production on difficult heat treat jobs. Once again we invite you to—

see flamatic in action

selectively hardening the lobes of an internal cam for a newsmaking automotive transmission. (Flamatic handles 2000 of these parts a day at the customers plant, with practically no rejects.) As in previous demonstrations, you'll be able to learn how Flamatic may help improve your product and lower your costs. Our staff of application engineers will be on duty to give personal attention to your problems.

visit booth G-356
metal show: detroit
october 15-19

flamatic

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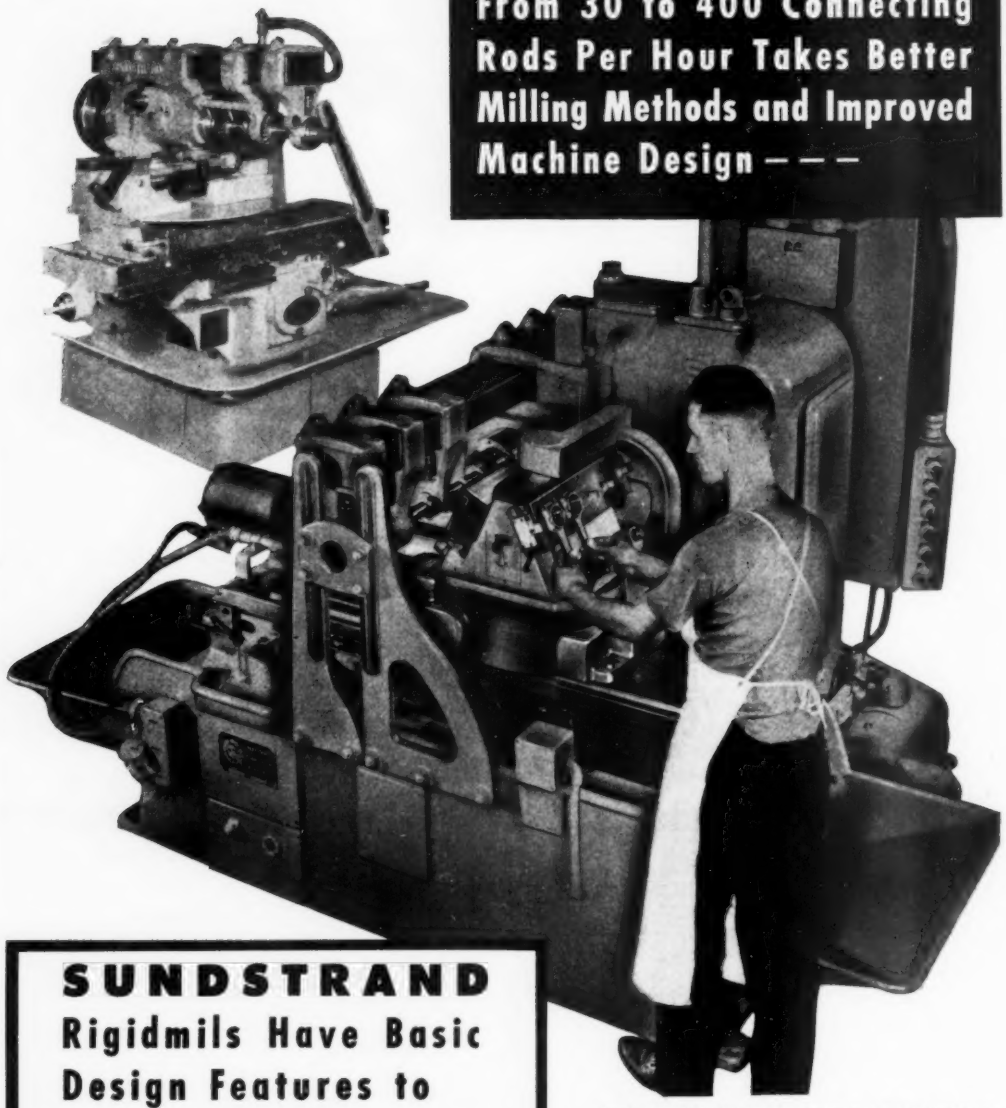
Cincinnati 9, Ohio, U.S.A. • CINCINNATI

From 30 to 400 Connecting Rods Per Hour Takes Better Milling Methods and Improved Machine Design – – –



Two Sundstrand Rigidmils tooled-up for similar jobs. Machine in background was built in 1936. Rigidmil in foreground is similar to present day designs.

SUNDSTRAND Rigidmils Have Basic Design Features to Improve Production

At times we lose sight of the fact that considerable progress is being made in metalworking methods and in the design of machine tools. These two Rigidmils provide an interesting example of the progress made over a period of a few years. Although the operations are not identical, they are close enough for comparison. Machine in background was built

SUNDSTRAND

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

in 1936. It has a manually operated index base which carries a fixture holding two connecting rods. Production is 30 rods per hour.

Rigidmil in foreground has *automatic index base and magnetic holding* fixture. Production is 400 connecting rods per hour. Here are some of the design features that make progress like this possible:

13 Rigidmil Design Improvements Make More Productive Methods Possible

Some of the more important design improvements in Sundstrand Rigidmils are listed below. Check these against your present milling equipment. Perhaps now is the time to plan a replacement program in your plant.

1 Wider Speeds

Every Rigidmil has a wide selection of feed rates to accommodate various types of metals.

2 Wider Range of Feeds

. . . . to meet most production requirements in all types of metals.

3 Larger Quills

. . . . are provided to facilitate carbide milling with greater horsepower.

4 Heavier Heads for Greater H. P.

. . . . and to maintain greater accuracy at high production.

5 Larger Working Areas

. . . . to hold more parts in one cycle or longer parts.

6 Better Materials

. . . . used throughout all Rigidmils.

7 Hardened Steel Table Ways

. . . . to insure consistent accuracy in machining.

8 Climb Milling

. . . . to accommodate cycles where loading and unloading can be done while milling.

9 Automatic Lubrication

. . . . to cut down maintenance costs, simplify operator's duties.

10 Longer Saddle Bearing

. . . . to insure accuracy in production machining.

11 Fast Rapid Traverse

. . . . to minimize non-cutting time of machine.

12 Larger Coolant Supply

. . . . to accommodate long periods of production machining.

13 Automatic Intermittent Cycles

. . . . to minimize operator's duties and facilitate production milling.

FREE

Milling Methods

This book will give you many suggestions for production milling methods. Standard, semi-standard and special machine applications to milling problems are described in detail. Write for your copy today. Ask for bulletin 112.

SUNDSTRAND

SUNDSTRAND

Machine Tool Company

2533 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

ARMSTRONG

ARMSTRONG TOOL HOLDERS

answer both . . .

1. **The problem of lowering costs**
2. **The problem of increasing output**

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

Stocked by Leading Tool Departments

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. Armstrong Ave. Chicago 30, U.S.A.

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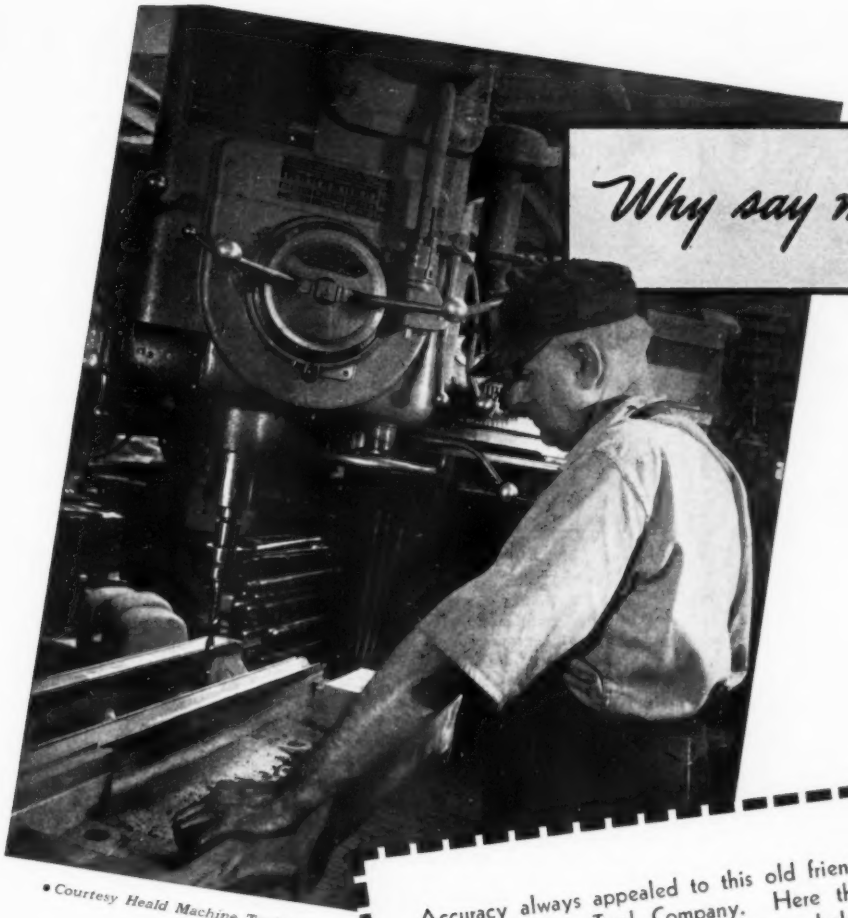
Write for Catalog.



• Courtesy Heald Machine Tool Company

Why say more?

Accuracy always appealed to this old friend—The Heald Machine Tool Company. Here they are boring, facing and reaming numerous holes in a 1360-lb. casting.

They say, and we quote: "We bought this Cincinnati Bickford Super-Service Radial Drill to increase war-time production. We also have ten large and a flock of smaller ones. Why say more?"

Cincinnati Bickford Super-Service Radial Drills are always accurate, dependable tools, highly productive and profitable in the shop.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9, Ohio U.S.A.**

"I told you not to let him in! He has a grip like a JACOBS CHUCK!"

IF IT'S A

JACOBS

IT HOLDS

THE JACOBS MANUFACTURING CO., WEST HARTFORD 10, CONN.

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Nothing New

Originality, as commonly defined, is thinking up or doing something that has never been thought of or done before. By that definition, it would be difficult to find many really original ideas. Apparently, Leonardo da Vinci thought of everything, including the airplane. Oliver Evans, in 1804, actually built a vehicle, called the Oructec-Amphibian, which ran under its own power from his shop in Philadelphia to the Schuylkill river, crossed the river, and went up the far bank. His book "Millwrighting," published in 1807, shows bucket and screw conveyors for handling grain, long before such equipment was in common use. Yet, without hearing of these, other men had similar ideas which were just as original as though they had not been thought of before.

The new T-lathe by Lodge & Shipley (*AM*, Aug 6, 1951) is a case in point. I have no doubt that the idea was original with the designer, for few mechanics have ever seen such a machine. Yet, I found one accidentally in the old Amoskeag shops in Manchester, N. H., when they were being dismantled. It was built about 1850 or '60.

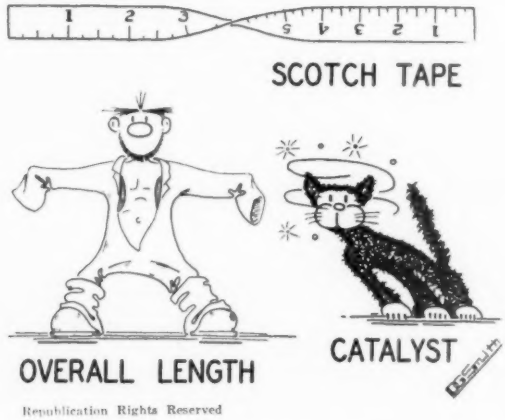
It would be interesting to know just what work this machine was originally built to do. The plant was essentially a textile mill, but locomotives and fire-engines were built there, too. Perhaps its most spectacular job was turning the turret rings for the Ericsson Monitor, which fought the Merrimac during the Civil War. I photographed the lathe just before it was dismantled, and the picture appeared in *AM* soon after.

In the early days of gearcutting in this country, George B. Grant built a hobbing machine. He did a lot of experimenting, but couldn't make it cut gears to suit him, so he abandoned the idea, thinking the principle at fault. Years later, Gould & Eberhardt began experimenting with a German machine. The original Eberhardt showed me the machine and was troubled with flats on the teeth, just as Grant had been, and was not sure the method would ever produce work as good as the regular machines with formed cutters.

Perhaps the advantages of climb milling have been "discovered" by more men than anything else. In 1895 I wrote a story about Amos Brainard, a well-known milling ma-

GRINETICS

BY D. G. SMITH



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5 OPERATIONS ELIMINATED

with GROUND and POLISHED STRESSPROOF®

ON ONE COMPRESSOR SHAFT

REPLACED *ALLOY* STEEL!

Originally, this compressor shaft was machined from A4615 alloy steel, then carburized, quenched, cleaned, straightened, and ground twice. When the manufacturer changed to new *Ground and Polished STRESSPROOF* for this part, machining was the only operation required—all other operations were eliminated! The result: faster production and an over-all savings of 59¢ per shaft.

This case is typical of the dramatic results possible with *Ground and Polished STRESSPROOF*—the finest ground bar steel produced. This bar eliminates many costly manufacturing operations because of its unique combination of four important qualities in-the-bar: strength... wearability... minimum warpage... accurate polished surface. And this sensational steel machines fully 50% faster than heat-treated alloys of the same hardness!

INVESTIGATE, NOW!

La Salle STEEL CO.

1416 150th Street, Hammond, Indiana

Manufacturer of the Most Complete Line of Carbon and Alloy Cold-Finished and Ground and Polished Bars in America

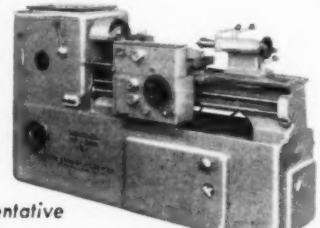
Speeds THREADING of ROCKET MOTOR!

5" ROCKET MOTOR — 60 Seconds
Material SAE X-1020 — 450 RPM
4 1/4" Dia. — 12N — Length 15 1/2"
Single Thread — Tool Kennametal K4H

MAKERS of MILITARY EQUIPMENT, PARTS and COMPONENTS

are alert to Cri-Dan Single Point Threading

CHECK THE SPEED, ECONOMY AND VERSATILITY of the Cri-Dan Single Point method of generating threads against any other method, and you'll know why so many production men are going for the Cri-Dan in a big way. Tool costs average only $3.20. Changeover in 15 minutes! Simple controls enable average worker to produce precision threads.



Contact your Lees-Bradner representative

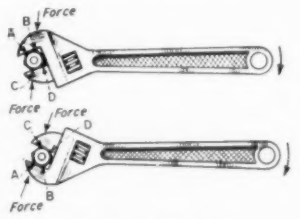
The LEES-BRADNER Company
CLEVELAND 11, OHIO, U.S.A.

chine builder, who was experimenting with climb milling. Perhaps I was not as impressed as I should have been, for when, years later, it was "discovered" by a number of men, it seemed as new to me as to others. Yet I understand that Brainard patented the idea, and the compensating feed nut that made it possible, in the 1860's.

All this shows that anything may be original with the man who does it, even though Noah may have had the idea in the Ark. We are too prone to think the last man a copyist, when he may be just as brainy and original as the first man to think up the idea.

Fred Colvin
Point Pleasant, N. J.

Mr. Colvin's letter applies particularly well to our Practical Ideas pages. Once in a while, a reader complains that a certain idea is so old it has whiskers. Maybe so; but if we think it will interest a thousand readers, and offend only twenty oldtimers, we publish it. Conversely we often reject ideas which are similar to ones we have published before. In such cases, we think we may offend a thousand readers, and please only twenty who haven't seen it before. The idea you can use is the one you want, and once in a while, the whiskery one might actually be new to you.—ED.



Left-Hand Wrench

In the August issue of *AM*, you show the correct usage of certain tools. One is the "Crescent" type of wrench. The way you suggest, force would be applied at *B* and *C*, Fig. 1, making the movable or weaker jaw take the greatest force.

Now turn the wrench over and apply the force again to tighten the nut, and the force will be applied at *D* and *A*, Fig. 2. This applies force to the inside of the movable jaw and to the outside of the stronger or solid jaw.

Louis J. Wood
Long Beach, Calif.

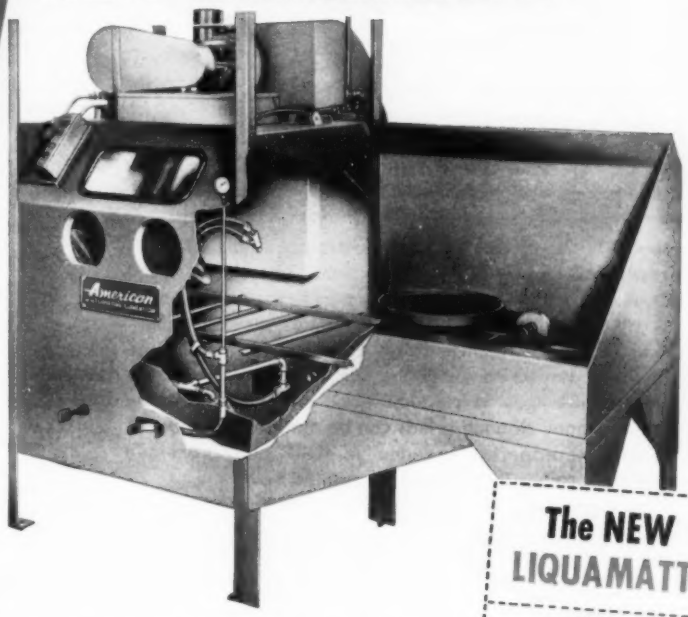
The article in question, "Know Your Hand Tools," appeared May

NOW!

a simplified method of wet blasting

THE NEW LIQUAMATTE

the machine you've always wanted for close tolerance finishing



Wet blasting to produce close tolerance finishes is a proven process that becomes even more practical, economical and convenient in the New Liquamatte. Operating difficulties often encountered in less modern designs now have been eliminated.

The Liquamatte makes finishing easier because any worker 5′ 8″ to 6′ 2″ tall can operate the machine without standing on platforms, stooping or crouching. He can start it with push buttons located at the working station. There are no valves to open or close.

In changing the abrasive size, he can drain the hopper in seconds without bailing. Inside cabinet design allows all abrasive to be completely removed without carry-over to interfere with the next operation.

A new vertical pump design overcomes leakage, shaft wear and plugging troubles. The lightweight Liquamatte gun is easily maneuverable and throws a steady stream of slurry from any angle. Ample clearance under the machine makes "good housekeeping" easy.

In the Liquamatte process, precision machine parts can be processed while holding tolerances of .0001″ without breakdown of sharp edges or corners.

The NEW LIQUAMATTE will be shown for the first time at the NATIONAL METAL EXPOSITION BOOTH F-439 BUILDING F Detroit, Mich. OCTOBER 5 to 19

American

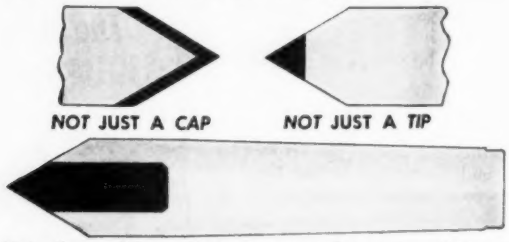
WHEELABRATOR & EQUIPMENT CORPORATION

317 S. Byrkit St., Mishawaka, Indiana

Gorham "M-40-U" ALLOY CENTERS
LAST THREE TO TEN TIMES LONGER

Here's a center that outlasts high speed steel and other ferrous and non-ferrous alloy centers from 3 to 10 times before it shows wear—and you can re-dress it countless times!

"M-40-U" is a special alloy developed by Gorham expressly for use as a wear, heat and abrasion-resistant metal. A core of this material is induction brazed in the steel shank of the center, after which the entire center is finish ground. Thus, the wear material is always supported by the tough shank steel throughout the life of the center. These centers require only a cleanup grind when wear finally occurs, and many cleanup grinds can be made without loss of wear-resistant properties, since the "M-40-U" alloy is actually a *deep core*, rather than a clad or applied *tip*.



But a *long, solid core* that you can re-dress many times—and get a good-as-new center every time!

This Gorham center folder gives full description, dimensions and prices. Send for your free copy today.

Gorham "M-40-U" Alloy Centers and Half-Centers are available for immediate delivery. Morse, Jarno or Brown & Sharpe taper shanks, all popular sizes in stock, "specials" to your specification. Put an "M-40-U" Alloy Center on every lathe, automatic and grinder in your shop—watch them pay for themselves in down-time saved, *PLUS* the precision production you get with centers that stay true longer.

Gorham TOOL COMPANY
"EVERYTHING IN STANDARD OR SPECIAL CUTTING TOOLS"
14408 WOODROW WILSON • DETROIT 3, MICHIGAN

29, 1950, and on Aug. 7 we published a similar argument, together with a rebuttal by Argus Sheridan, Crescent Tool Co. Mr. Sheridan stated that our original statement was correct, and that when used in reverse, wrenches break at 25 to 30% less than the strength given when used properly. These figures can be substantiated by actual tests made by Crescent.—Ed.

Rebuttal

I don't blame E. M. Lamb (*AM*, Aug 20,) for sticking up for his country, but I think he has a chip on his shoulder. Most informed people in this country are quite well aware that Britain has made some marvelous technological advances in the past few years, and fully appreciate the exceptionally high quality of British-made goods. But, while I do not doubt that they have some splendid, modern factories, I believe it is correct to say that the *average* British plant is a good deal behind the average American plant in equipment, lighting, ventilating, and heating.

I appreciate also, that the British do not place such high value on these items of human comfort. From my own experience in England during the last war, I gather that Englishmen don't *expect* to be comfortable in winter; over here, we do.

I agree with *AM* that Mr. Lamb has been reading the wrong papers, and suggest that he do not believe all he reads, or judge a nation by the activities of a few of its citizens. Because some bigot publicly burned British books a few years ago, just to get himself some free publicity, did not mean that Americans were anti-British. If we criticize you at times, it is only because we feel that your activities warrant it, and I know quite well that we come in for plenty of criticism on your side of the Atlantic. Please, Mr. Lamb, don't take this so seriously; we're none of us perfect.

R. Beauchamp
Chicago

Choo-Choo

I am a railroad fan and was very much impressed by the cover on the Sept. 3rd issue. Could you tell me where I could get a color print of the original?

Geo. Griffith
Boston

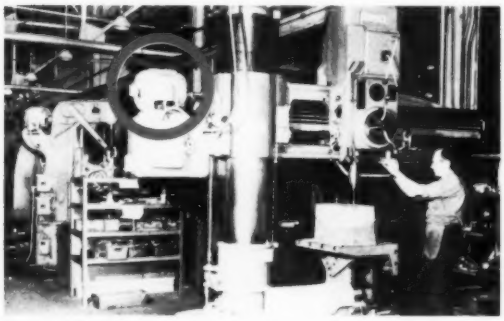
As we explained on the Chips page, this picture has not been published before. However, you might try writing to David Frank, American Locomotive Co.—Ed.

"We have three shifts in operation," says Julius J. Domonkos, Vice-President in Charge of Manufacturing, Bell Aircraft Corporation. "That's full production on a 24-hour day basis. For the past 10 years we've been depending on Tri-Clad motors to carry the load. We've never regretted putting our confidence in this fine motor!"

G-E Tri-Clad Motors drive the machines that are instrumental in producing helicopters, guided missiles, rocket motors, research aircraft, and jet aircraft engine nacelles for our rapidly expanding armed forces. At Bell Aircraft Corporation, G-E Tri-Clads are known as a thoroughly dependable motor —tough on the outside . . . on the inside . . . at the bearings.

BELL AIRCRAFT CORPORATION:

"We've been depending on Tri-Clad* Motors for Ten Years . . ."



This Tri-Clad driven radial drill takes care of most of the large dies for the entire Bell plant. Big dies and bolster plates are drilled and tapped on this machine, a critical part of the Bell operation. Despite continuous use, plant personnel can't remember a single interruption due to Tri-Clad failure!

*Reg. trademark of General Electric Co.

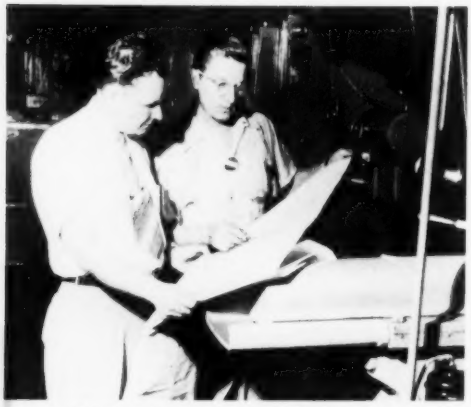
FASTEST BOMBER IN THE WORLD! Jet engine nacelles for the 600-plus miles-per-hour B-47 are being produced at a record-breaking clip in the Bell plant at Buffalo, N. Y. The "Stratojets" represent a major advance in bombardment aircraft.

GENERAL ELECTRIC

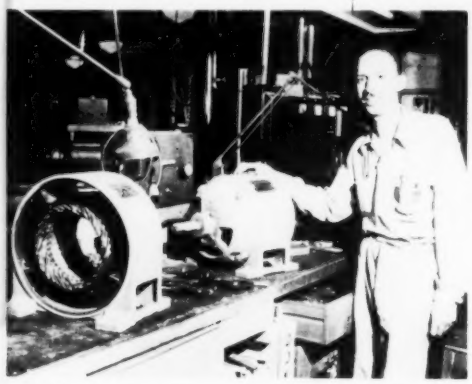
TRI CLAD MOTORS

REG. U.S. PAT. OFF.

Help keep Bell Aircraft production up!

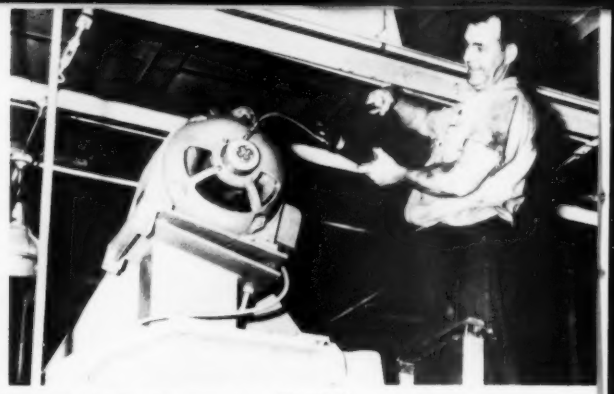


Marvin Limburg (left), Foreman of Bell's Tool and Die Shop, comments, "I don't believe we've ever lost machine time due to breakdown of Tri-Clad motors. And our jig-borers, for example *have been operating around the clock for the last 8 to 10 years!*"

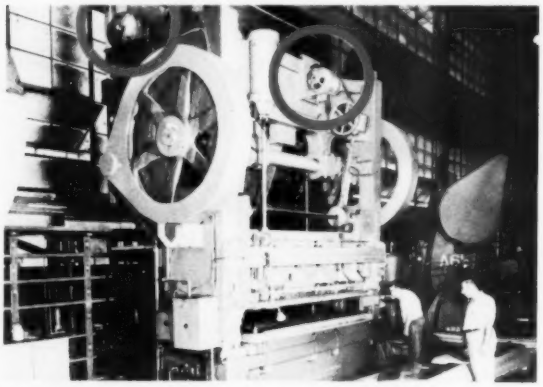


"It's the easiest motor we have to maintain" according to Maxwell Anderson, Crew Chief of Bell's motor repairmen. "There's more working room inside and more room in the slots. It's become a byword with us that if you give a Tri-Clad motor ordinary care you'll never have to worry about maintenance."

TIMELY READING—With every electric motor needed on the line, you'll want a copy of the G-E manual on "How to Maintain Motors and Generators." It's free; just ask for bulletin GET-1202. *Sect. 752-10, General Electric Company, Schenectady 5, N. Y.*



Greasing isn't necessary on a Tri-Clad motor in normal service, but it's always reassuring to know that you *can* lubricate if you so desire, without time-consuming disassembly. The photo shows how easy it is: remove relief plug, attach the grease gun nozzle, squirt—the job is finished.



This huge punch press is an important tool maker. Anton Geiser (right), assistant punch press foreman, says: "I can't recall a single shutdown of this section due to motor failure." Almost all motors in this department are Tri-Clad. This is another Bell Department which has been operating around the clock; cannot afford to lose time because of motor breakdown.

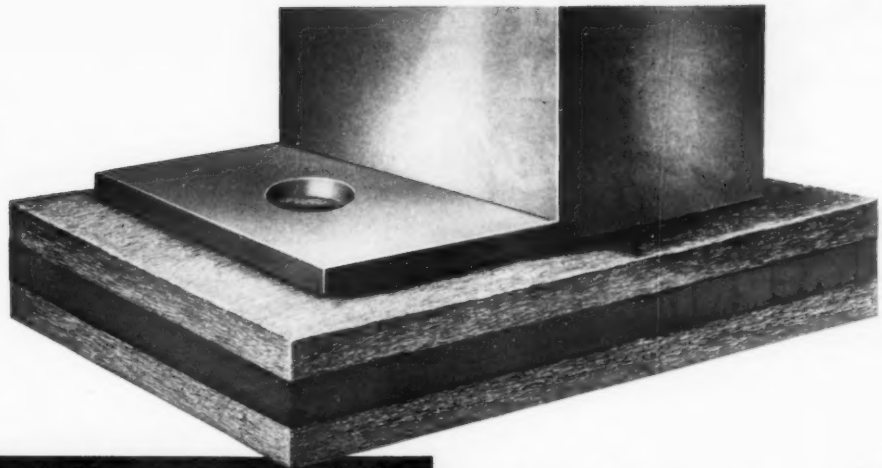
NEW! A Helpful Training Course on Motors!

Everyone concerned with technical training problems will want this new G-E Motor Selection and Application Course. Consists of 9 short, easily understood lessons. Complete kit —slide films, review booklets and instructor's manual— $100.00. Call or write your nearest G-E sales office.

Look at the Scope of this Course

1. Fundamentals of Motors
2. Types of Motors
2. Fundamentals of Selection
4. A-C Induction Motors
5. Single-phase Motors
6. D-C Motors
7. Synchronous Motors
8. Adjustable-speed Drives
9. Gear Motors

GENERAL ELECTRIC



Here's another of the many dramatic examples of where UNISORB — the "no-bolt, no-lag screw, no floor drilling" Machine Mounting — has paid off handsomely in flooring that is as good today as the day it was laid. This is a 75-foot clock conveyor line at the plant of the manufacturers of famous Telechron Electric Clocks, Worcester, Mass.

Do Away with DESTRUCTIVE Floor Drilling

Mount ALL Your Machines and Conveyor Lines on UNISORB®

No bolts... no lag screws... and no more old-fashioned, costly floor drilling. That's what you get when you switch to the modern machine-mounting... UNISORB.

What's more, you'll save installation time. A special cement, which we supply, securely bonds the UNISORB pads to machine feet and floor with a holding strength of 5000 lbs. per square foot *minimum*. And, if you so desire, we pre-cut and pre-shape the UNISORB pads to fit the machine feet ready for immediate use.

In addition to these important savings, you'll do well to remember that UNISORB eliminates 60-85% of all transmitted machine vibration and noise. This means longer life for machines, for floors, for buildings . . . and a substantial lowering of the noise factor for improved working conditions and morale.

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210-N SOUTH STREET, BOSTON 11, MASSACHUSETTS

Offices: New York, Philadelphia, Chicago, Detroit
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GET THE FACTS... ALL THE FACTS... ON UNISORB®— TODAY!

YOU CAN *Forget* MODERNIZATION

as soon as your competitors do

72" KING Vertical Boring & Turning Machine at Caterpillar Tractor Co., Peoria, Illinois. Piece being machined is a side shift rack for "Caterpillar" No. 12 Motor Grader.

Terrific demands are being made on machine tools by superimposing a defense economy on our normal civilian economy. Machines must be worked two or three shifts with an inevitable result—*accelerated obsolescence*. That's why manufacturers with one eye on the present and one on the future are *modernizing now*. They assure for themselves efficient, lower-cost production during the emergency . . . and a big edge on competitors handicapped by worn-out, obsolete equipment when business returns to normal.

Distributors in Principal Industrial Centers

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

SPOT NEWS of Metalworking

- **Kaiser will reopen part of Richmond, Calif., shipyards** and expects to start in mid-winter to machine there some 90 aluminum forged parts for Boeing's B-52A. Plant modification and tooling costs will be over $6 million. Aircraft parts production has been under way at its San Leandro plant for several months.

- **D.P.'s have proved a blessing to some metalworking companies caught short of men.** Experience with them in one midwestern city has been excellent. One company has set up English-teaching classes for them, along with training courses in other subjects. Some Canadian firms are reported using D.P.'s too.

- **An important industrial machinery maker** is setting to work with part of his engineering staff to redesign his products with the post-defense period in mind. His idea is to obsolete as many of his current models as he can.

Magnesium alloys of greater strength, improved corrosion resistance and better fabricating characteristics can be formed by a new process revealed in a research report made for the Air Force by Dow Chemical Co. Atomized magnesium powder is mixed with powder of the alloying metals and the mixture is extruded.

- **Franklin D. Roosevelt's birthday** is one of the three new paid holidays demanded by the union in one of the eastern aircraft companies.

- **New process for chemical polishing of aluminum,** known as Alubril II, has been developed by Light Metal Experiment Institute in Milan, Italy. It is improvement on Alubril I, previously announced, and is based on simultaneous action of phosphoric acid and a mixture of acid salts of alkaline metals and alkaline earths. The new acid polishing bath does not attack the rustless austenitic steel of which the containers for the polish are made.

- **Australian arms factories are to make the new British 0.280 semi-automatic rifle.** Other weapons made in Australia may be converted to 0.280 calibre to make possible interchange of arms and ammunition in wartime.

Impact extrusion of high-strength aluminum alloy plane parts is to be used extensively by a West Coast manufacturer. It has earmarked 15 small parts for production by this process at a notable saving in cost. Later it expects to make 177 parts in this way.

- **General Motors is planning big expansion of facilities** for making Holden cars in Australia to be exported to South-Asian countries. Delivery lag on Holdens is now three years.

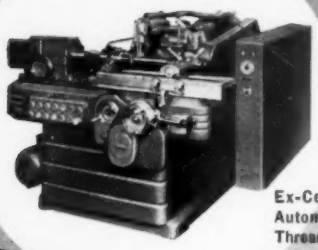
- **Government intends to haul into court** five companies in midwestern city for violations of NPA regulations. Two will be accused of concealing inventories, two more of doubling their actual third-quarter needs for CMP materials, and the fifth of padding its orders for materials. Companies may be given chance to make amends without publicity.

- **Air Force has urged Curtiss-Wright, Glen Martin and Buick** (and others) to place orders for machine tools with European builders in effort to speed tooling programs. Curtiss-Wright has purchasing commission in Europe. Some foreign builders are asking 25% cash payment with orders. For further machine tool news, turn to page 121.

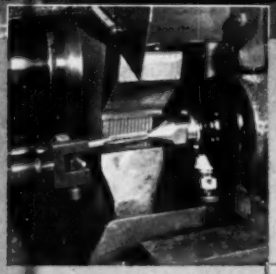
- **Reopening of cast-steel armor plants** will put operators of steel casting plants in a dither. Worry stems from low supply of scrap. Where the scrap is to come from was subject of recent meeting in New York of industry members with government people.

THE BUSIEST MACHINE IN YOUR SHOP

EX-CELL-O AUTOMATIC THREAD GRINDER



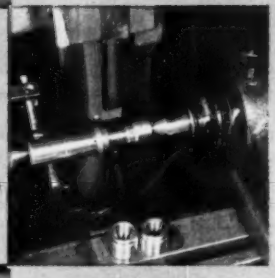
Ex-Cell-O Style 33 Automatic Precision Thread Grinder for external threads. Standard models for internal threads and universal models for both internal and external threads also are made by Ex-Cell-O.

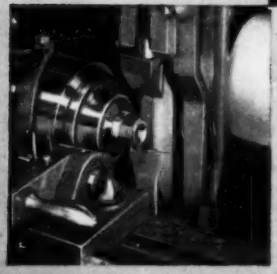


Grinding threads on cast-iron part with diamond dressed multiple-rib wheel on a Style No. 33 Grinder.

Skip-tooth diamond dressed multiple-rib wheel (wheel form is twice pitch of thread) grinding a ⅝"—18 tap.

Threading stainless steel aircraft bushings on an Ex-Cell-O Style 33 Automatic Thread Grinder.





Grinding threads on the end of a machine gun barrel which is held within a special work head.

For high production with extraordinary precision, Ex-Cell-O Style 33 Automatic Thread Grinder is a popular choice. It is easy to set up and operate. With equipment for using multi-rib wheels, as shown in the accompanying photographs, output exceeds other methods.

Thread grinding is a must for hardened steel parts. More and more shop supervisors are discovering that grinding is also economical for materials that are tough and abrasive, or soft materials that are inclined to tear under the pressure of cutting tools.

For more information on thread grinding call your Ex-Cell-O representative or write directly to Ex-Cell-O. Please state whether you are interested in internal or external threads or both.

XLO

EX-CELL-O CORPORATION DETROIT 32 MICHIGAN

51-28

MANUFACTURERS OF PRECISION MACHINE TOOLS CUTTING TOOLS • RAILROAD PINS AND BUSHINGS DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington

The pinch of mobilization—the squeeze everyone has been talking about for a year—finally is in sight. Military production is going into high gear. It will take steadily increasing bites of materials through 1952.

• • •

Unofficial reports of military requirements for next January-March point this up. Steel needs will be more than 150% of October-December allotments, the highest yet. Increased demand for aluminum, copper, other scarce metal will be even stiffer.

Weapons are rolling down production lines, though actual deliveries are still lagging. So demand for materials is nearing a peak—for tools and components, particularly.

• • •

We're entering the "bottleneck phase" of the arms build-up. The breaking of bottlenecks in production of military end items will get top consideration for government aid on materials.

That means other production will be cut back, at least until late next year. That's when new output of steel and aluminum will begin to ease supply of those metals.

• • •

But no more drastic cuts for consumer goods are contemplated now by the controllers. They figure: no worthwhile metal savings could be achieved; consumer goods makers will be down close to break-even production levels under fourth-quarter metals allotments.

Further cuts, if any, will be for specific lines—not across-the-board for civilian items. They'll be made only where enforced by shortages of materials other than steel.

• • •

Some "essential" industries will bear the brunt of the military impact on materials. The controllers already are thinking of slowing expansion programs of several industries:

Electric power—to save structural steel for new plants and copper that would go to equip them. Starts on plants not tied to defense needs may be deferred six to twelve months.

Railroad equipment—goal of 10,000 freight cars a month may be reduced temporarily. Also, conversions from steam to diesel locomotives may be ordered to a halt.

Natural gas—new pipelines may be held up to free more tubular steel for petroleum.

• • •

This is geared to a reappraisal of expansion to make it match materials supply and actual mobilization needs. The job should have been started long ago, but the controllers are just getting to it.

Expansion has become a Frankenstein to the mobilizers. They've been giving it aid—rapid tax amortization, loans, building licenses. But until now, no one toted up the cost in terms of materials.

• • •

So Wilson ordered a review of new plant plans—How much steel, aluminum, chemicals, components, etc.; when and what materials will be needed; what each will contribute to defense. Part of the answer already is obvious: There aren't enough materials, particularly structural steel, to meet present expansion timetables.

• • •

So spacing out of expansion schedules is in the works—for even the most urgent types of new plant. Even the military will be asked to put off starts on new bases.

And fast tax write-offs will be harder to get. They've been used as a club to get scarce materials for new plants. So look for Wilson to crack down.

Military needs will pinch manpower, as well as materials. The services build-up already has started. Marines are adding 40,000 men to build up to newly-authorized proportions: Three full divisions and three air wings.

The Army is calling two more National Guard units, a division from Ohio and another from Illinois. Another guard outfit will be called up soon. The Navy soon will start calling 8000 junior officers from the Volunteer Reserve. The Air Force will take most of its reserves this winter.

• • •

DPA boss Fleischmann is under fire. It's not too serious yet, but for the first time he has run into real opposition from fellow bureaucrats. He's stepped on important political toes, the insiders say.

• • •

The Salary Stabilization Board, in Regulation No. 3, has told employers what individual executive and other white-collar salary raises they may make based on merit or length of service.

If you follow these rough rules, you may go ahead and pay the salary raises without the need for getting SSB's approval:

The average of all increases in the group must not exceed 6% of the base salaries; where you use salary ranges, no person's salary may be lifted higher than the top salary for the job; where you do not have salary ranges, the limit for any one person is 10% a year.

The individual increases are on top of the 10% "catchup" you are allowed over Jan. 1950. SSB soon will tell you how to make cost-of-living salary boosts since last January.

If you have paid a profit-sharing, Christmas or other type of year-end bonus in the past, you may do it again if you don't increase the bonus kitty.

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Detroit

Automobile production planning continues a question mark—and an argued one at that. NPA believes the industry will be able to build 1.1-million cars in the fourth quarter—the official quota—if it wants. Industry people don't see how, what with copper shortage compounding their earlier steelworkers.

NPA indicates that if the auto people don't build the full total, it will be because of sales problems, not supply headaches. Sideliners, meanwhile, sight the possibility of a new car shortage—more demand than supply. So there you are, pro, con, and take your choice.

Manufacturing in September, in any case, improved from the Labor Day week's low of about 103,000 cars and trucks, US and Canadian plants, to upwards of 136,000 in the succeeding week. Thereafter the near-term outlook was for unchanged schedules.

Truck volume, incidentally, is not only steady, but maybe on an ascending plane, due to enlarging volume of military vehicles. It's currently in excess of 30,000 assemblies a week.

• • •

As production improved, so did factory employment. As of Sept. 15 it was estimated at 689,000 in the Detroit area, up 8,000 from six weeks earlier. It probably won't hold that level, but it shouldn't fall off too far. Why so? Summer automotive shutdowns balanced out a share of NPA-enforced curtailments, for one thing.

Machine tool, tool and die, and other similar shops are busy indeed. Bookings continue to lengthen out: the incoming orders are for both civilian and military requirements—though the latter continue to run proportionately heavier.

• • •

The automotive companies, too, are getting to closing stages of deals for making machine tools. Meanwhile some of them are renovating machines in their tool shops. They're close-mouthed about the volume of that kind of work being done. Reason: If they admitted to doing a good deal of it, they might have a harder time (so they feel) getting deliveries on new machine orders. If they admitted not doing much of it, they might be subject to criticism. Result: They say nothing at all.

• • •

Tooling prospect: Continental Aviation & Engineering, subsidiary of Continental Motors at Detroit. CA&E has gotten US rights to make the French Turbomeca gas turbine line—nine models ranging all the way from aircraft jet installations to compressor units for power tools. Horsepower range: 200 to 1100.

These may have highly significant applications. Not the least notable of these applications is in smaller-size aircraft — heretofore out of the area that turbines could power. CA&E is jubilant over its acquisition; its big problem is finding technicians to help get into production.

• • •

Interesting wrinkle alongside the many transfer machines in the new Ford engine plant, at Cleveland: All units with more than 40 spindles have "tool boards" alongside, on which complete replacement sets are mounted. When a tool goes bad, it can be replaced immediately.

• • •

To see the ultimate in corporate, research and engineering buildings, go to the new General Motors Technical Center, slowly taking shape northeast of Detroit. Construction of the new buildings is all but breathtaking—almost completely glass on three sides, made possible by special truss and exterior wall columns. An outer sheet of glass filters solar heat rays, decreasing glare, while the inner sheet is untinted.

The window mullions—dividers—are architectural columns, a functional part of the building.

The engineering shop building has but one row of interior supporting columns, giving either side two clear spans 80-ft wide with 14-ft clearance for roof trusses above the finished floor.

Much new equipment is going into the engineering shop, and more will be added when the research buildings are completed later on. Quite obviously General Motors is sparing nothing to make this the finest industrial investigative center anywhere.

• • •

Kaiser-Frazer will spend several million dollars through its subsidiary, Kaiser Manufacturing Co., to modify and tool a plant at Richmond, Calif. There, 90-aluminum forgings used in the B-52A Boeing bomber will be machined. Production is to begin before the end of the year.

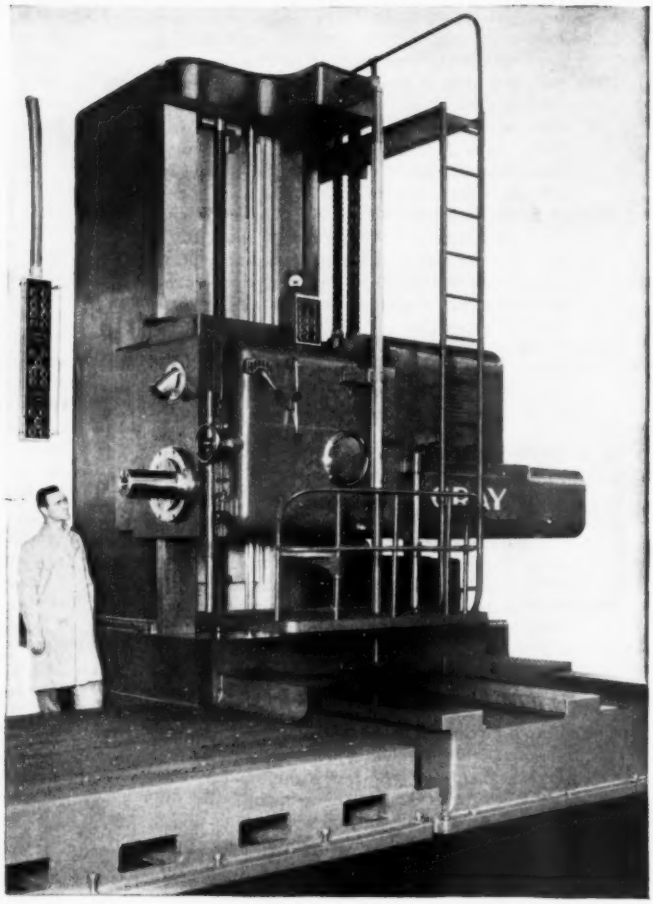
K-F, meanwhile, is far enough along on its cargo plane manufacturing program at Willow-Run that virtually all employees laid off early in 1951 have been recalled. Total employment, now 11,000, is to reach 20,000 by next summer.

• • •

How do you go about building a complicated aircraft wing section, as a subcontractor? Here's one approach being employed: The prime contractor ships through a complete assembly for study by the subcontractor, once the jigs are set up. Then he ships a complete assembly, slightly disassembled. The subcontractor puts it together. Then he ships another set, more disassembled; the subcontractor puts it together.

At the eighth stage, the shipment consists entirely of disjointed pieces. By that time the subcontractor is familiar enough with the pieces and with his jig and fixturing that he and his previously green crew are able to do the job.

WHY—100 H.P.?



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That is why GRAY Horizontal Bars have spindle motors running up to 100 HP—Power Cross Feed to Column so milling cutters can be mounted directly on the large diameter driving sleeve instead of the bar—Columns as large at the top as at the bottom to minimize bending and torsional vibration.

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Machine Tools

Defense contractors, with encouragement of the Air Force, are turning to foreign sources for machine tools. Some of them have agents or entire commissions in Europe.

Curtiss-Wright is said to have ordered around 1100 machines in western Germany. Its representatives also have negotiated with the Union of Italian Machine Tool Constructors for some $1.5 million of machines to be supplied by various Italian builders. Curtiss-Wright also has bought machines in Switzerland.

• • •

Buick also is reported to have ordered German machine tools. Glenn Martin has been urged by the Air Force to look abroad for some of its tooling requirements.

Western Germany's drilling machine builders are having a field day, with U.S. orders.

British, who have ordered 4000 machines in Germany, are worried for fear that U.S. contractors, dangling dollars in front of German companies, will get priority in deliveries. The British placed their orders months ago.

• • •

French machine tool builders are getting a share of this windfall of orders from this country. All of these foreign "deals" are made on a basis of time urgency. European companies can deliver machines many months ahead of U.S. companies.

Washington is watching to see that no European country imports U.S. machines for its defense program and at the same time exports the same type of machines back here.

• • •

One big U.S. contractor says that European builders are making a practice of requiring 25% in cash with the order. If the order is placed through an agent in the U.S., this means that the contractor must pay the initial 25% from his own working capital and is not reimbursed until the machine is delivered and ownership turned over to the government.

Machines have been ordered, in some cases, "sight unseen." In one instance 24 machines were so ordered. When the contractor's men got to the builder's plant in Germany and saw what was to be turned out, the quality was so poor that the order was cancelled.

• • •

Over $500 million of pool orders have been sent out by General Services Administration. One order being negotiated runs to $69 million.

GSA is operating on the theory that it needs to have on hand actual cash equal to only 30% of total orders placed. At first it was very cautious and decided to hold its commitments to twice the money at hand. It has liberalized that rule the past few weeks.

Builders have accepted pool contracts in excess of $200 million. Largest single order accepted to date is for $33 million. GSA is confident of further large acceptances in the near future.

Surprisingly few builders have requested the 30% cash advance. GSA's guess is that necessary working capital is being secured mostly from local financial sources. However, at least one builder has solicited a V-loan.

There is no exact time limit for deliveries on pool orders. They vary with the condition of each builder's order board and with critical types of machines required.

But GSA will not allot a pool order for deliveries beyond the end of 1952 except under extraordinary circumstances.

• • •

Fisher Body, after several false starts and Washington's assurance two weeks ago that the deal was off, is slated to build a flock of Bullards.

It is to be a subcontractor to Bullard, rather than a prime contractor. But a huge pool contract is involved. The pool contract presumably will go to Bullard.

GSA is said to be ready to finance the new equipment which Fisher Body must install for this job. Fisher Body's price per machine is very much higher than Bullard's.

• • •

A large press builder is dickering with a metal-cutting machine builder for a large subcontract to make right-angle lathes for jet-engine production. The British are involved, because their orders comprise a good share of the defense orders which would make possible this subcontract.

The prime contractor is asking Washington to waive NPA's M-41 rules and permit more than 30% of its monthly output to go to the British. Final signing of the subcontract may hinge on this point.

New orders for machine tools in August amounted to 488.3 on the NMTBA index, against 490.6 in July and 558.8 in June. Shipments rose to 177.3, compared with 144.7 during July. But August production was less than June's.

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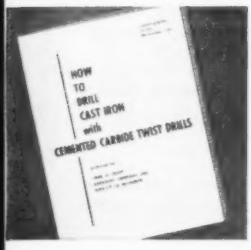

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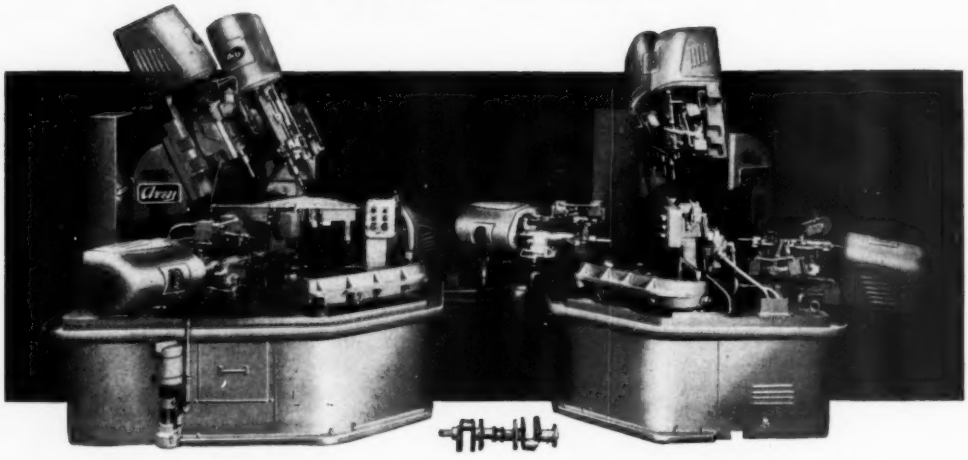

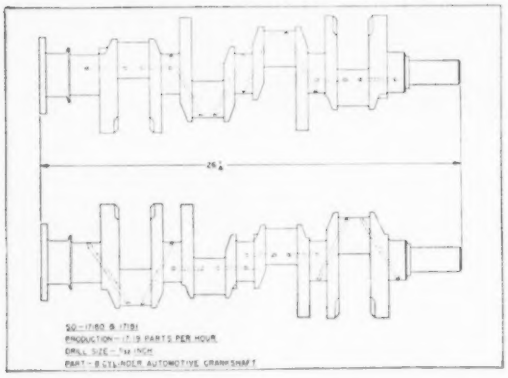

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—S. O. No. 17180 and No. 17181—with four No. 1 *Avey-draulic* (hydraulic) Deep Hole Drilling Heads, mounted and aligned to drill oil holes in crankshafts . . . is really a "bear" for production!

Drilling Heads are equipped with torque-matic control and have a 12" ram travel. The coolant system is built in the fabricated base. The hydraulic power source is a separate unit.

Two of these machines, as arranged in the photograph, will drill simultaneously all oil holes in the eight-cylinder crankshaft.

Fixtures—The fixtures were hydraulic automatic clamping and were supplied with swinging cradle for loading.

Material—Drop Forged Steel.

Let Avey Engineers Assist You With Your Production Problems

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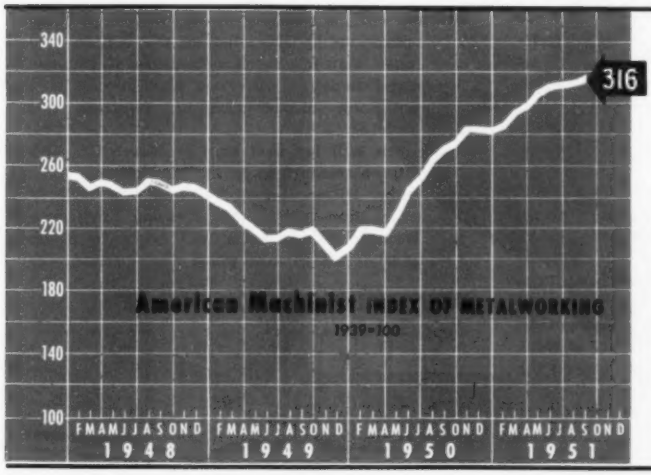
Gaging Metalworking



INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	SEPT '51	AUG '51(p)	JULY '51(r)	AUG '50
	316*	312	311	279
Machinery	304	310	251	
Electrical Manufacturing	346	342	321	
Automobiles, Trucks	217	220	264	
Transportation Equipment	448	433	279	
Other Metalworking	309	317	303	

* Estimated (p) Preliminary (r) Revised

Big Defense Output Still Months Away

Big volume of defense production still is months off. In some armament items, it is nearer a year. Impact of munitions output, however, is growing steadily.

Defense goods — tanks, plane parts, shell — comprise only 9% of current manufacture in one key city. And that's pretty typical of the nation.

If related items are counted in, total defense production would rise to 20-25%.

• • •

The pace of munitions work will be stepped up some by end of the year. But next March is a good guess on the timing of the start of really big operations.

Aircraft expansion, especially jet engines, will not come nearly that fast.

• • •

Almost all companies are having their troubles with materials. Getting a CMP allotment is only the beginning. The tough problem is to persuade mills to accept your order. Users often end up by being promised 80% or less of the tonnage to which they are entitled.

Copper is the chief limiting factor, and will continue to be. Aluminum is a close second.

Aluminum producers are having their problems. Four aluminum reduction plants in Northwest have had their "interruptible power" cut off by Bonneville because of power shortage. These plants get 24% of their power this way; they supply about half the nation's aluminum.

• • •

Makers of consumer durable goods — autos, appliances—are pessimistic about fourth-quarter output, what with materials troubles and heavy inventories still on hand.

Sales have picked up, however, and should continue slowly upward. Manufacturers feel that stocks are likely to be down below normal by next spring, with chances of shortages showing up.

• • •

Take a look at these doings in Metalworking: Stamping plants are being caught between not enough defense orders and shrinking production for civilian use. About 21% of their business today is military, 24% is automotive.

Industrial fastener people are held down by paucity of steel bars, rod and wire. Less than one-third of output is for armament work. They complain about mess caused by CMP and high costs resulting from delivery of wrong size of raw materials.

• • •

American Machinist's Index, based on manhours worked, is running about 13% ahead of last year. But there is a mixed trend in the components. Some are up, others down. The defense industries are the ones forging ahead.

Biggest gain has been in transportation equipment —planes and railroad equipment. Machinery production too is way up.

Industrial production made a comeback in August. It rose to 218 (1935-1939 equals 100), but fell short of the April-May level of 223.

September probably will top that level. Both durable and soft goods will show a gain.

Gaging Business

Gray iron foundries producing heavy castings have fabulous backlogs. Modernization and mechanization carried out few years ago are now paying off. Industry will produce 15 million tons of castings this year, setting new record. Previous high was 12.9 million tons in 1950.

Foundries turning out light castings report cut-backs from auto and appliance makers.

Steel casting plants are running close to full capacity. Almost all production is for defense.

The puzzler is: Where is scrap to come from? Some plants have been down to two-days' supply at time of year when inventory usually is built up.

• • •

The tip-off about contract tool and die shops is this: Orders have been over 8000 manhours of work each month this year, a figure hot reached the preceding five years.

Fresh gain of 11% in backlogs sent graph off the chart (confidential) maintained by National Tool & Die Manufacturers Association.

Shops just can't get more men. The industry has a starry-eyed outlook—36% of owners think it excellent, 57% as good. No one reported poor.

• • •

Pacific Coast, fretted by shortages of manpower and metals, has been hit by another shortage—power. As outcome of driest summer in 20 years, a general brownout may be necessary.

Aircraft operations in Los Angeles area are increasing. Aircraft employment is up to 152,000, compared with 118,700 last January.

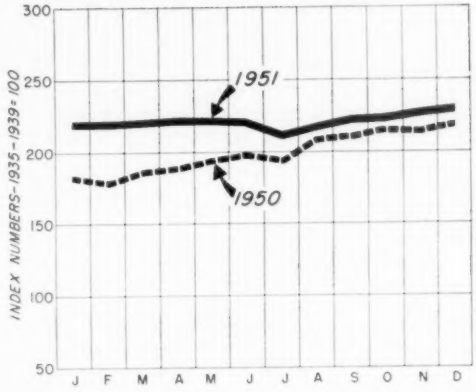
Migration to this area is building up the labor supply. But machinists, die makers and tool makers are hard to find.

Because of allocation quirks, some plants making civilian items have adequate materials for remainder of year.

Defense work is slowly growing. Rheem will begin operations in December on $77 million of defense contracts in new facilities at Richmond and Downey, Calif. Food Machinery's tooling for tank manufacture is reported going smoothly.

Bethlehem will lay first keel in March on its $47 million contract to build five high-speed cargo ships. Hiller Helicopters has new order for evacuation-type and training helicopters. Western Gear Works will begin to produce gear drives in new plant next summer.

INDUSTRIAL PRODUCTION PICKS UP



	1950	1951		1950	1951
Jan.	183	221	July	196	213
Feb.	180	221	Aug.	209	218
Mar.	187	222	Sept.	211	223*
Apr.	190	223	Oct.	216	225*
May	195	223	Nov.	215	228*
June	199	222	Dec.	218	231*

(*) estimated

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	230.2	229.7	221.3
Steel ingot production (thousands of tons)	2,023	1,999	1,936
Electric power output (million kilowatt hours)	7,138	6,795	6,449
Production of automobiles and trucks	136,452	103,224	185,421
Engineering construction awards (*Engineering News Record*, millions)	$232.4	$189.2	$238.9

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1935-1939 = 100)*	218	213	209
Index of durable manufacturers' production (1935-1939 = 100)*	207	263	247
Durable goods manufacturers' sales, millions*	$9,748	$10,660	$8,670
Electrical machinery manufacturers' sales, millions*	$1,011	$1,199	$924
Other machinery manufacturers' sales, millions*	$1,916	$1,992	$1,374
Durable goods manufacturers' new orders, millions	$10,413	$12,018	$10,553
Electrical machinery manufacturers' new orders, millions	$1,204	$1,431	$934
General machinery manufacturers' new orders, millions	$2,247	$2,480	$1,764

* Seasonally adjusted.

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Two milling machines and two operators per shift, two shifts a day, were required to produce the rack teeth and finish the jaw face on 8000 movable wrench jaw forgings. The Detroit Broach set-up which has replaced the milling operations produces the same number of parts with one operator, one machine, on one shift per day . . . savings in labor alone amount to $2112.00 monthly! And that's not all.

The original tool cost for the broaching set-up was lower and the cost of tool maintenance is reduced materially. In respect to quality, the manufacturer reports much better surface finish, more consistent dimensions, uniformity of parts.

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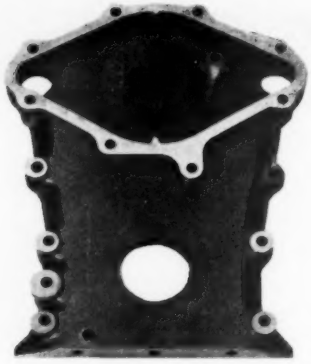
Here's the part

Front cylinder cover for popular automobile engine.



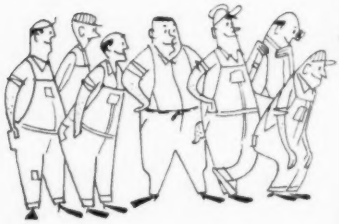
FIRST CYCLE

Station 1: Load on piece
Station 2: Horizontal Head—
Drill 3 holes 5/16" diameter
Drill 8 holes 13/32" diameter
Bore 1.80" diameter
Station 3: Horizontal Head—
Drill 4 holes 13/32" diameter
Chamfer 3 holes for 3/8—16 tap
Drill one hole for .1563 diameter ream
Station 4: Horizontal Lead Screw Tap Head—
Tap 3 holes 3/8—16
Ream one hole .1563"

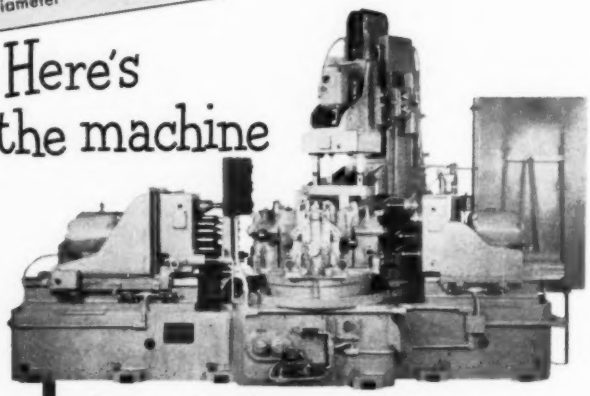
SECOND CYCLE

Station 1: Transfer and load
Station 2: Horizontal Head—
Drill 3 holes .257 diameter for 5/16—18 tap
Station 3: Horizontal Head—
Chamfer 3 holes for 5/16—18 tap
Vertical Head—
Rough bore and chamfer 2.558" diameter
Section 4: Horizontal Lead Screw Tap Head—
Tap 3 holes 5/16—18 tap
Vertical Head—
Finish bore 2.558" diameter

Here... the cycles



Here's the machine



Illustrated is a MORRIS four-way machine with a 36-inch automatic indexing table. The 34-spindle machine performs a two-cycle operation with four two-position hand clamp fixtures. Produces 88 parts per hour at 80% efficiency.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Use Men Where They Are

Getting men is one of the toughest jobs facing defense contractors.

General Motors goes so far as to say that manpower eventually will be the chief factor limiting defense production.

The scramble for men, particularly for skilled men, is on. And it will become wilder as the weeks go by.

The trouble is that there are just so many skilled workers in existence. It takes time to develop these experienced men. It can't be done in a four-weeks' course.

ONLY HOPE is to persuade men now at work in civilian-goods plants to transfer to defense plants. That is a stiff assignment. The reason is that these men usually have acquired a comfortable seniority which makes them reluctant to give up certain job rights to start out afresh on a new job.

The fact is that civilian-goods firms are loath to lose these men. After all, this is only a semi-war economy. A substantial volume of normal items still can be produced. Managements will hang onto these experienced men as long as possible.

Washington, in turn, wants the work forces of defense contractors built up. But it shrinks from the disagreeable task of telling men where they must work. That might be an act of political suicide at this time.

WHAT IS the answer then to the manpower problem? It is twofold. Each manufacturer who is pressed by the necessity of getting out more defense goods should keep plugging away at the job of increasing his shop force. Progress may be discouragingly slow, but it should be steady.

Beyond that, he should subcontract work at every opportunity. Subcontracting has some liabilities, to be sure. It runs up costs, for one thing. Its supervision may be a real headache.

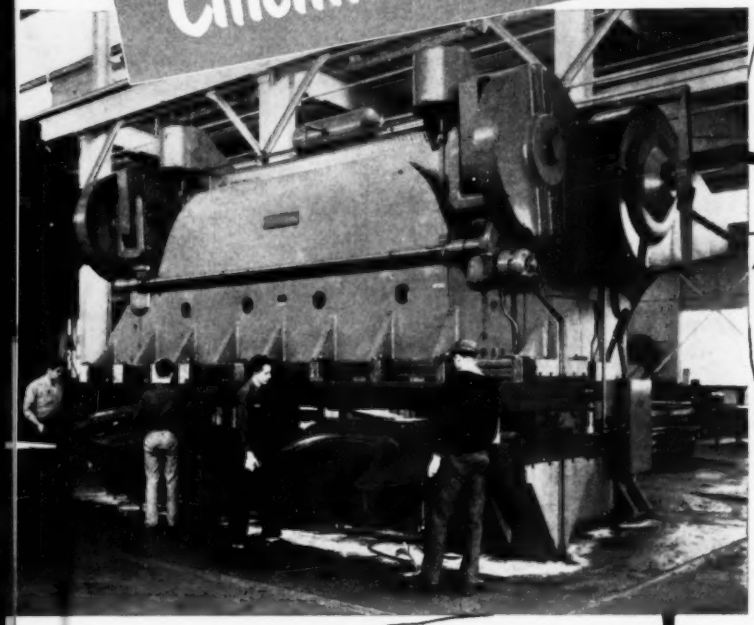
But it possesses distinct assets. It makes use of men, including skilled men, where they are. And it makes use of idle machines at a time when new machines cannot be secured in less than one year to two years.

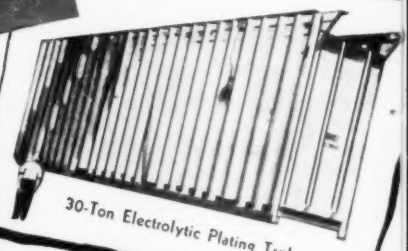
LONG AGO Washington was quoted as saying that the defense program calls for a relatively small number of prime contractors and a large number of subcontractors. With the manpower situation shaping up as it is, the need for widespread subcontracting becomes obvious.

It is a sensible way to get increased production fast. And it will help mightily to ease the tightness in manpower.

Burnham Finney

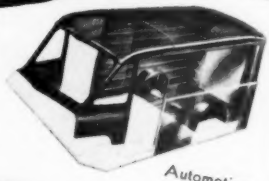
DO IT ON A VERSATILE Cincinnati Press Brake





30-Ton Electrolytic Plating Tank

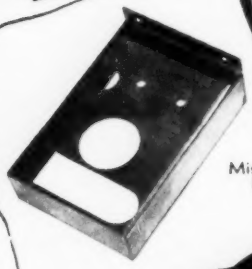
Control House for Steel Mill

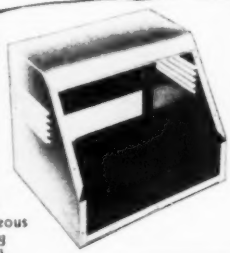


Automotive Products

Illustrations courtesy of Charles T. Brandt, Inc.

Roll Tables for Steel Mill





Miscellaneous Forming

The press brake capacity of Charles T. Brandt, Inc., adequately takes care of the job, whether large or small—in jobbing or production quantities.

In a highly competitive field, the powerful and versatile Cincinnati Press Brakes are profitable performers. They not only meet competition—they set the pace.

Write for catalog B-2A, describing operations, features, and special arrangements including wide beds and rams, bed and ram extensions, deeper gaps, higher die space and other features.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

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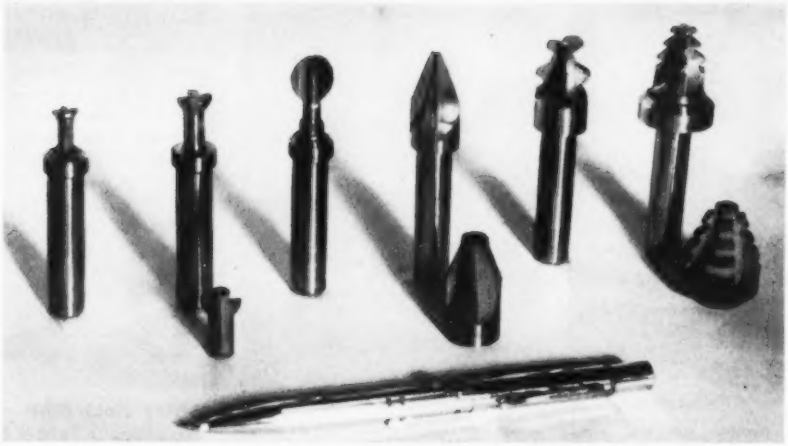


Carbide form cutters at a practical price are possible when the compact is preformed before final sintering. A few of the possible shapes are shown, along with some "as-sintered" preforms. The pencil emphasizes cutter size. Finished flutes contain a ground (not polished) mirror finish which adds considerably to tool life

NOW YOU CAN MACHINE 'GREEN' CARBIDE COMPACTS

Produce carbide cutters with a minimum of man-hour expense . . .

Save diamond wheels and grinding time . . .

Form intricate shapes previously uneconomic . . .

Keep tool-life-to-output costs to a minimum . . .

Reduce scrap losses when a single slip of the wheel destroys hours of diamond grinding . . .

Use less carbide and increase quality . . .

Consider carbide inserts for applications economically unsound by previous standards . . .

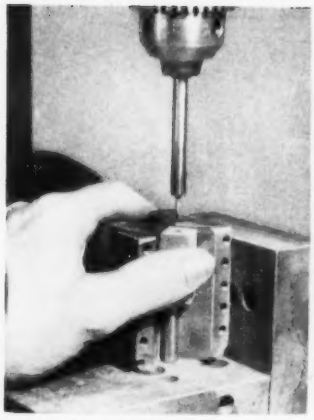
BY HENRY SWENSON, President
J. & S. TOOL COMPANY
East Orange, N. J.

CARBIDE TOOLS are expensive. Since the days when they were first used they have become less expensive, but never so cheap that special tools were practical for short-run jobs. When Metalworking was confronted with the "super-alloys" and the newer high-temperature materials, carbides became a necessity; making the product possible, not inexpensive.

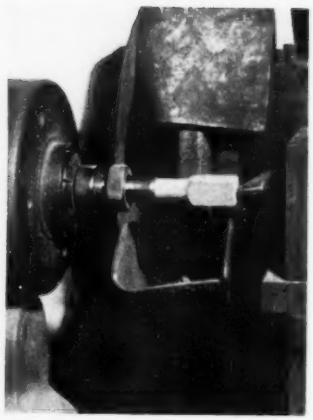
A solid carbide milling cutter (complete form of the cutter solid carbide, brazed into a counterbored moly HSS shank), properly set up, costs approximately $100 and should produce 60 to 100 slots in titanium compressor disks. Hence, the finishing cut in one complete disk may be completed before the cutter need be reground undersize for roughing use.

If HSS cutters were used, at $10 per cutter, tool life would be one cutter per slot, or a total of from $600 to $900 per turbine wheel. This, of course, would be prohibitive.

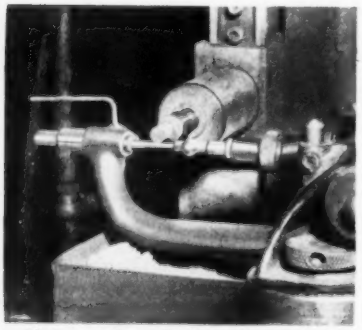
All that is needed then, is a tool with the life of carbide but no more expensive than HSS. What makes carbide tools expensive? Two things: First, the high cost of the original



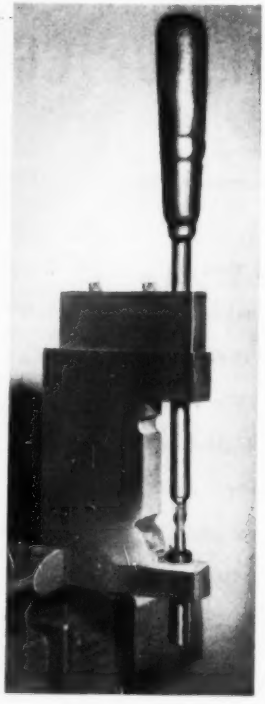
1 **"Green" carbide compact,** semi-sintered, is hand-held against a stop in a V-block for centering. Special center-drill is carbide brazed into a steel shank. All handling requires extreme care as compact is easily cracked or chipped. Blank is about 20% longer than final form and large enough to permit shrinkage and finishing



2 **Special collet** is used for all forming operations; was designed by J & S Tool Company when regular holding devices failed to provide sensitive control of "squeeze." Collet contains an integral center concentric with fingers, and knurled ring permits sensitive adjustment of finger pressure. Coarse grain Crystolon wheel is used straight for roughing shank and formed for grinding ball or tree shape



3 **Flutes are formed** with a diamond wheel on a bench surface grinder. Wheel must be relatively coarse or it will load and rub, thus cause workpiece to break. Speed used is the maximum permissible for the wheel, or the top machine spindle speed if this is not available. Feed is *very light* and strictly a matter of operator experience and sensitivity. All preform grinding is done dry. After flute forming, cutter is returned to carbide supplier for final sintering.



4 **Brazing is the second operation** after final sintering. First, the short shank of the now-hard carbide is ground to size and the rest of the cutter is cleaned up. Then, the carbide, together with a silver solder preform, is placed in the HSS shank which is held by the brazing fixture. The two are held and rotated together during heating to provide a sound joint and maintain straightness throughout the tool. Brazing method is conventional

material. Second, the hours of grinding (plus the expensive diamond abrasive) needed to produce the form. Also, if a single tool is scrapped when nearly complete, the loss is considerable and must be absorbed by the remainder of the order.

Here was the problem we faced: We had first to reduce the material cost, then to cut the machining time. We believe that we have solved both. Although our first product is form-milling cutters, the process is applicable to the manufacture of similar carbide tools.

Cutting Blank Cost

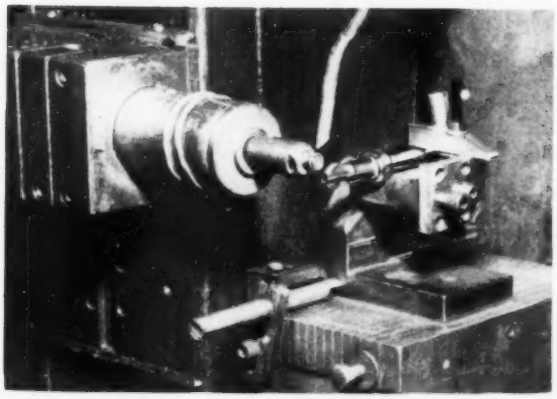
To reduce the cost of the original carbide blank, two changes were made in the design. We decided, first, to use carbide for the cutting head only, and braze this to a HSS shank. By seating the carbide, properly brazed, on the steel shank, the entire tool is made stronger. The carbide will break before the bond will separate, and the steel shank provides much more strength than the solid carbide shank. Failure of the latter shank means the loss of the entire tool, whereas if the steel shank is damaged the carbide can be remounted in another shank. Also, if the carbide cutter is broken, the steel shank can be used again and is much more readily formed to fit a variety of tool-holders.

But we were not satisfied to simply reduce the length of the carbide blank. By studying the design of the tool in section we found that the use of a square shape instead of the round blank then in use would reduce both the blank size and the amount of material to be removed. Use of the steel shank had reduced the blank diameter too.

Eight for One

As a result of these two changes we can produce *eight* carbide cutters from a blank which originally was needed for one cutter.

Our next objective was to reduce the manufacturing time required to form the cutter. The most apparent method for accomplishing this was to machine the blank before it was fully sintered.



5 Final flute grinding is done after brazing. First, however, every dimension on the cutter is checked on a comparator, using a master layout. The comparator is used at each step of manufacture—from rough forming the "green" compact to the final cleanup. During preforming, about 0.015 in. is added to all of the final dimensions to provide material for cleanup after sintering. Final sizing is accomplished with a diamond wheel and conventional coolant. Most of the J & S grinders are equipped with special spindles which may be removed with wheel intact, for truing, and not disturb the setup

6 Converted J & S two-angle-tangent-to-radius dresser is used as the final radius-grinding fixture. It, too, is used on a surface grinder and grinding is done with a straight diamond wheel. Dresser is ideal for the purpose as it is accurate within 0.0001 in. and provides positive stops. This step completes the cutter. Its manufacturing cost (less material) is about the same as for a HSS cutter

However, this was more easily said than done. Would a semi-sintered carbide compact have sufficient bond strength to permit machining? Could we predetermine final shrinkage closely enough to hold the extremely close tolerances called for on cutters? How much handling and breakage loss?

We started by ordering a quantity of oversize blanks from Adamas Carbide Corp., Harrison, N. J., each of which was partially sintered to a different degree. We tested these until we found a happy medium of sufficient bond strength and workability. To control shrinkage, one sample piece out of every batch was fully sintered and allowance was made for the resulting percent of shrinkage in machining the remaining blanks. This is still done and shrinkage averages 18-20%.

Grinding Blanks

Machining of the partially sintered compact would have to be by grinding. A single-point cutting tool would concentrate too much stress on a small area, a multiple-tooth cutter would set up excessive vibration, thus crack the blank, and even a carbide tool would not hold an edge for very long if used on this abrasive material. Tooling is best described by the series of photographs. When we started, about three years ago, the grinding of a single cutter preform took 30 min and our worst problem was breakage—which ran as high as 30%. Now preform grinding requires only 10-12 min per pc and breakage is less than 1%.

Finishing

A further improvement in tool-life is achieved as a result of the extreme accuracy of the J & S "Fluidmotion" dresser, which makes it possible to hold 80% of the ball diameters to −0.00005 in. of maximum limit. The keen cutting edge has a 0.0001-in. clearance on an 0.008-in. primary back-off. As primary clearance relief angle was increased the tendency toward tool chatter increased, so we established the 0.00001-in. clearance on the primary land. Even slight chatter causes cutters to cut oversize, dull more rapidly, and it impairs surface-finish quality. By a simple grinding operation, the tool flutes are now finished to 0.1 to 0.3 mu in. rms, as recorded by a Brush surface analyzer and a profilometer.

Used on aluminum, a carbide ball-cutter 0.500 in. dia is rotated at 8000-9000 rpm and fed at from 19 to 30 ipm. One cutter is capable of producing more than 5000 slots. A similar HSS cutter is limited to a feed of 2½ ipm at 2500-3400 rpm, as determined by size variation. Tool life is less than 50 slots per cutter. Ball cutters for producing these turbine-wheel slots vary from 0.296 to 0.600 in. dia. Although the carbide cutters seem to operate at 30 ipm without difficulty, this feed is not recommended as it will greatly increase the danger of breakage.

Speed for titanium is 400 to 800 rpm and feed is 1½ to 2½ ipm, as determined by cutter size and shape. At this production rate there is a minimum advantage over HSS of 50 to 1.

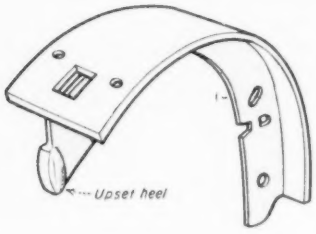
Application of these cutters to stainless steel is now being studied. No production rates are available, but it is definitely ascertained that an abundance of power is needed and that the cutter spindle must be in balance. Without sufficient power the cutter apparently hesitates for an instant as it hits a tough spot in the material. Instant workhardening at the point of hesitation causes tooth overload.

SPOTWELDER DOUBLES AS HOT UPSETTER

Here's a new and somewhat unconventional use for a spotwelder, but one that works well and saves lots of time and trouble

BY WILLIAM E. FINNEY, Superintendent
Brake Assembly Division
WAGNER ELECTRIC CORP., ST. LOUIS

Single-ram special National spotwelder, equipped with hydraulically actuated table fixture, hot-upsets heel ends of steel brake shoes. Electrode inserts and location stops in fixture can be changed to suit 9- to 15-in.-dia shoes. Control cycle of machine also actuates fixture clamping cylinder. Similar setup for two parts is also done on twin-ram machine



Heel, hot upset in operation described, is shown at left end of fabricated brake shoe. Heel must be upset to almost twice the width of the web stock from which it is formed, and side surfaces must be smooth and parallel

Hot-upsetting operations on the heel sections of fabricated steel shoes for Wagner automotive and truck hydraulic brakes are performed in National 150-kva special spotwelders with automatic heat and hydraulic ram pressure. The heel section is upset to a thickness of 0.307-0.312 in. from a flange only a little more than half that thickness. Side surfaces must be smooth and parallel, and not less than 5/32 in. wide, and we experienced considerable electrode wear when the upper electrode assembly for the machine was made from conventional materials.

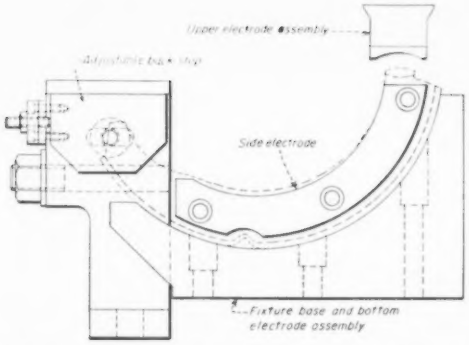
The fixture, as shown, consists of a three-section bottom electrode, and two side electrodes moved by hydraulic cylinders to close around the web of the work, to insure adequate electrical contact for proper heating. When the electrodes are opened, it is a simple matter to insert the arcuate shoe assembly, and bring the nose end against the backstop. The operating cycle of the welding machine insures close control of the automatic heating and squeezing portions of the cycle.

To minimize wear of the upper electrode assembly, we incorporated two Grade CA-10 Carboloy side blocks, which confine the hot metal as it is upset. An Elkonite Grade 20-W-3 insert, silver soldered in the copper body of the electrode, does the actual upsetting as the press ram moves down. But this material was found unsuitable for use in making the confining side blocks.

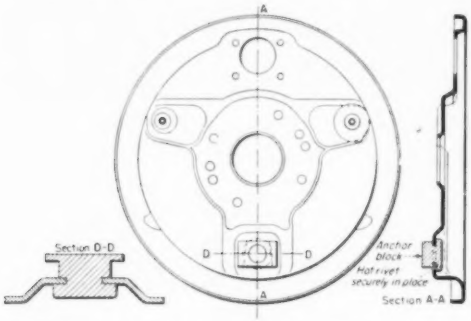
To minimize dragout loss of the carbide blocks when the upper electrode is moved away from the upset heel, both are ground with 1° relief. This small relief angle has been found to mean the difference between success and failure of this carbide application.

Riveting Operation

Anchor blocks must be positioned accurately and riveted securely into the drawn steel backing plates to insure accurate alignment of the brakes. Several riveting methods were tried in an effort to develop a high-quality, low-cost production procedure. The latest procedure, which is giving completely satis-



Principal elements of electrode assembly for hot upsetting heels on fabricated steel brake shoes. The backstop can be adjusted to suit shoes 9 to 15 in. in dia. But for each change in size, a new set of fixture base and side electrodes must be mounted

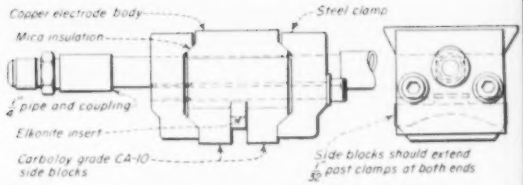


Broached slots in each side of anchor block must be centered accurately in backing plate. Hot upsetting of rivet extension on block has shown best results

factory results, consists of hot-upsetting the anchor blocks in place with a 250-kva National resistance welder equipped with a hydraulic ram.

Special tooling was developed jointly by Wagner and National Electric Welding Machines Co. A separate fixture was necessary for each size of backing plate, because of the size range involved. Hydraulic clamping cylinders were built into the tables of each machine to actuate the clamp slides in the fixtures. In each case, the slide aligns and locks the anchor block into place before the backing plate is positioned.

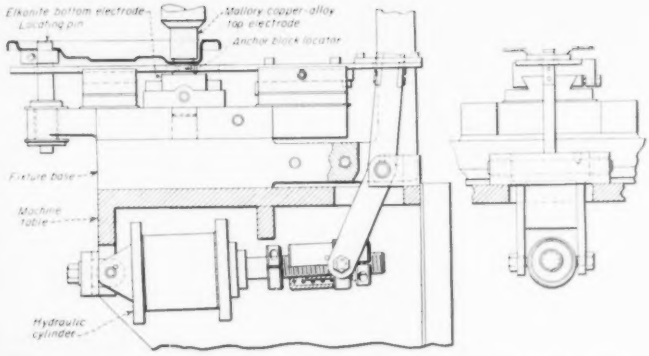
Automatic controls on the spotwelders provide a timed cycle for a heat, dwell and press cycle which has been found to give best results. In this cycle, the rivet extension machined on the anchor block is heated to about 1900 F, holding at this temperature for a few seconds to insure transfer of heat throughout the rivet section, then squeezing to form the flat upset head found to lock the block most securely. For most sizes of backing plates, production averages about 290 assemblies per hr.


Copper electrode body
Steel clamp
Mica insulation
1/4" pipe and coupling
Elkonite insert
Carboloy grade CA-10 side blocks
Side blocks should extend to post clamps at both ends

Upper electrode has Elkonite insert for actually upsetting the metal, and two Carboloy side blocks to confine the metal and form the flat, parallel sides. Mica insulation 0.002-in. thick is inserted between the steel clamps and the carbide blocks. The Elkonite insert is silver-soldered in a groove milled across the face of the copper electrode

First step in backing plate assembly cycle consists of positioning anchor block in clamp of fixture, then inverting plate over rivet extension on block and locating pin in front of fixture

Automatic cycle of National 250-kva spotwelder insures heating rivet extension of anchor block to 1900° F and holding it at this temperature for several seconds to insure heating the rivet throughout for best upsetting conditions

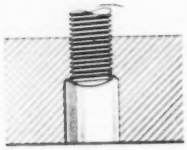


Minimum fixture height, and adequate clamping of anchor block, are insured by this hydraulically operated tool mounted on the table of a Model 400 National spotwelder. Compression spring on piston rod insures constant clamping pressure

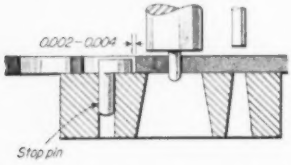
Hydraulic ram of spotwelder is retracted at end of automatic cycle, leaving assembled back plate ready for removal. Operator meanwhile has secured an anchor block and a backing plate, ready to start the next cycle

DIEMAKER'S KINKS

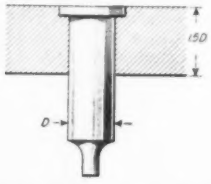
BY FEDERICO STRASSER



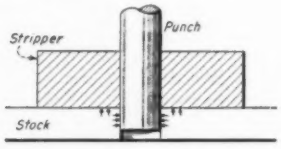
THREADED HOLES in dieplates should be avoided, particularly in hardened members. If there is no way to avoid them, make their length approximately equal to the screw diameter by relieving the bottom part with a drill.



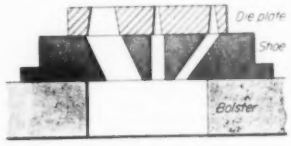
PILOTS in blanking punches operate in conjunction with some kind of stop, usually a simple stop pin. In such cases, the stop pin should be located so the strip will move 0.002 to 0.004 in. away from it, when the pilot enters the pierced hole. Sheared dies or burred holes are thereby prevented. Pilots are not recommended for stock of 0.01 in. or less, because the holes are easily drawn while centering.



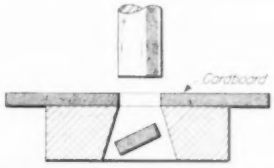
PUNCH-PLATE THICKNESS should be at least 50% greater than punch diameter. Punch plates are not hardened, but are preferably made of tool steel.



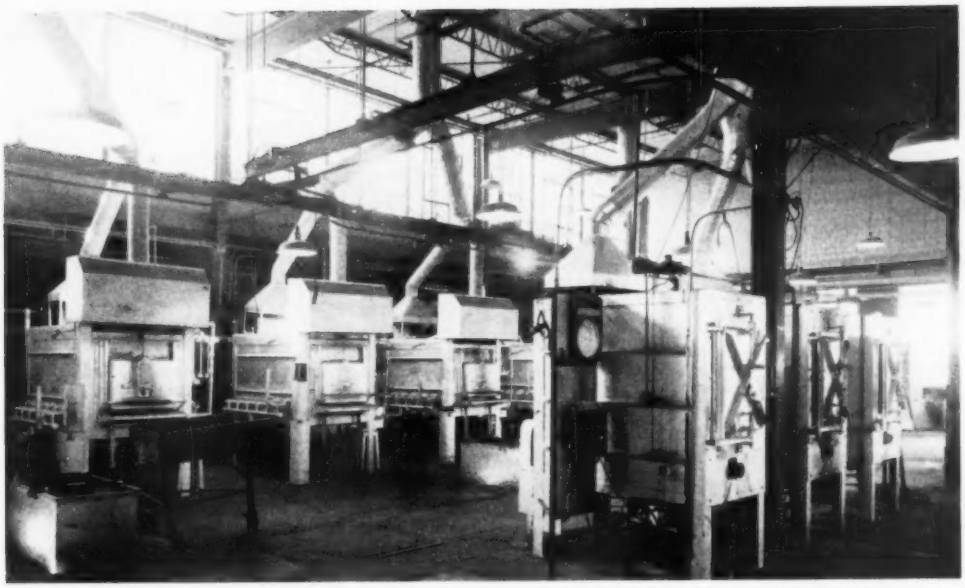
STRIPPING-PRESSURE calculation is influenced by many factors: stock thickness, kind of material, clearance, surface finish on punch, stiffness of stripper plate. But for an approximation, use one of these rules: Stripping pressure equals 7 to 10% of cutting pressure, or equals 3500 to 4000 times length of cut in inches times stock thickness.



SLUG OR BLANK HOLES in the shoe of large progressive dies may cover an area exceeding the opening in the bolster. In such cases, one may incline these holes at an angle up to 45°, so that slugs or blanks are guided to the bolster opening. A greater angle will probably produce sticking of punchings in the holes.



IN SETTING A DIE, one cannot be too cautious. After having set the die and checked it, it is good practice before starting production to try out the tool with a piece of cardboard of the approximate stock thickness.



Only three operators are required to handle a battery of eight hardening furnaces (rear) and three drawing furnaces (foreground). If a hardening furnace needs repair, a ninth unit is put into the line with a fork-lift truck

CONTINUOUS PRODUCTION ASSURED WITH BATCH FURNACES

Major production losses are unlikely by reason of shutdowns, when batch furnaces are used. Besides, these furnaces are more quickly obtained and repaired than continuous types. For these reasons, and even the cost of operation, armament manufacturers should consider batch furnaces under delivery situation now prevailing

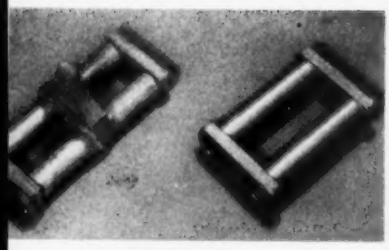
By GEORGE BRAILSFORD, Supt. Douglas Mfg. Div., KINGSTON PROD. CORP.

THE CURRENT defense program is bringing up again some of the production heat treat problems encountered during the accelerated armament program of World War II. Manufacturers again face scarcities in critical metals and increasing difficulty with deliveries on specialized heat-treat equipment. They also face a tight manpower market in respect to skilled and semi-skilled personnel. All of these factors create a situation in which it is increasingly difficult for manufacturers to produce the war materiel required.

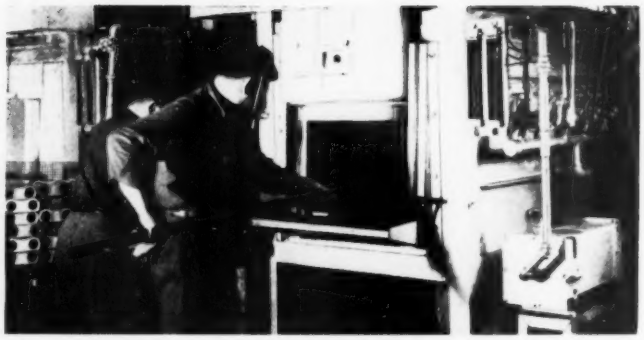
It is true that production rates with existing equipment can be stepped up by adding an extra work shift; by increasing man-hours per shift; or by increasing efficiency of materials handling. But even these improvements will not maintain the level of heat-treat production foreseen for the future. Additional new equipment must be obtained in the shortest possible time.

Specialized Equipment a Problem

Heat-treat processes involved in production of critical parts for tanks, guns and aircraft in many cases seemingly involve hard-to-obtain, specially designed, continuous furnaces with prepared-atmosphere generation and high-



Track-link bodies are relatively scale free after heat-treating (left) because inert DX gas is supplied to the hardening-furnace muffle



An atmosphere generator is located at the right of each hardening furnace. Thus, failure of any furnace or generator does not stop production when batch-type units are installed

alloy, radiant-tube heating. Some manufacturers find, however, that multiple installations of standard batch furnaces will solve their needs. Often, the operating cost of batch furnaces approaches that of a continuous unit, and they have advantages not inherent in a specialized, continuous facility. There is a good precedent by which to judge the effectiveness of such a program.

During World War II, the Douglas Manufacturing Division of Kingston Products Co., Bronson, Mich., made track-link bodies for tank treads. The contract specified a relatively scale-free hardened and drawn part in quantities large enough to warrant the purchase of a single continuous furnace with integral quench and draw facilities. But consideration of a continuous unit brought up these problems:

1. A continuous unit of standard design was not available for this process. Furnace-design engineering time was at a premium then, as now. Required design time would seriously prolong the delivery date.

2. The alloy required for furnace components was difficult to obtain. Spare parts were practically impossible to get with the initial shipment.

3. Another factor involved furnace downtime. In case of breakdown *all* production would be lost until repairs were completed.

These critical factors led Douglas to consider a battery of small batch-type, controlled-atmosphere furnaces of standard design. These standard units could be constructed from existing stock parts, and a full muffle of silicon carbide could be utilized to eliminate scarce nickel alloy. With a row of batch furnaces constantly in operation and spare units available as standby equipment, sustained production rates could be maintained with no danger of 100% shutdown.

Continuous Production Achieved

"Atmotrol" muffle furnaces and "Forc-Aire" convection furnaces produced by Surface Combustion Corp., Toledo, were selected for the job. Eight atmosphere hardening furnaces with a ninth unit as standby are situated in a single line on one side of the heat-treat room. Three draw furnaces are lined up opposite the hardening furnaces, and with their swing-doors facing away from the muffle furnaces. Water-quench facilities are located within easy reach of the muffle furnaces. One quench tank serves two hardening furnaces.

Track-link bodies of several designs, but of the same basic type, are hardened and drawn in this batch-furnace installation. End pieces of each part are forged from SAE 8640 steel. Seamless-tube connecting members are formed from SAE 1035 stock. Part weights vary from 5½ to 11 lb, depending upon design.

Relatively scale-free condition of the hardened and drawn parts is obtained. Since these track-link bodies are later bonded to a rubber tank tread, this surface condition is desirable.

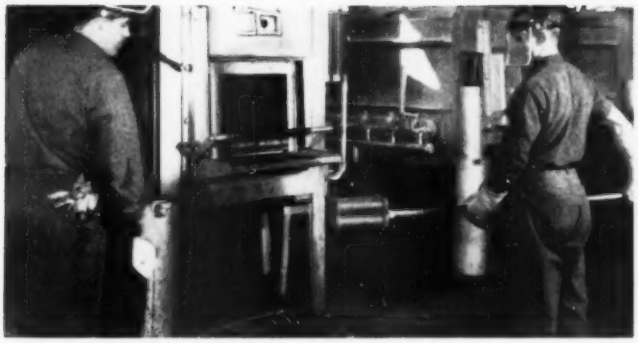
The hardening cycle involves heating the charge in DX atmosphere to a temperature of 1600 F over a 1-hr period and soaking for an additional 15 min. Temperature is automatically controlled and maintained with a minimum of over-ride. Parts are then immediately quenched in water. After removal from the quench tank, the parts are given a ½-hr. draw at 850 F and permitted to cool in air.

A Brinell hardness of 310-360 is achieved after the draw. A 100% hardness check within these limits is rigidly maintained.

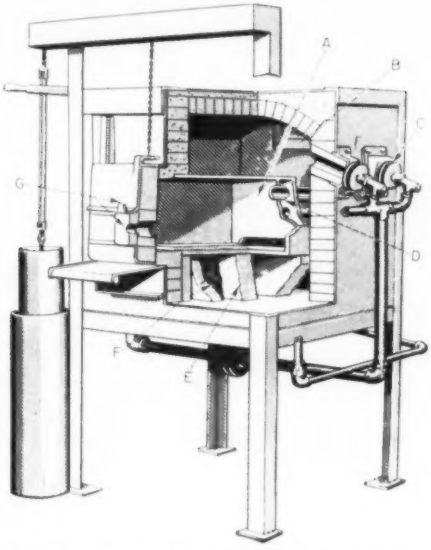
Down-Time Minimized

This complete heat-treat facility processed track-link bodies on a limited scale after World War II, and is now once more operating at full production.

Only three men are required to operate the entire facility. By judicious loading and consecutive discharging and quenching, all eight hardening furnaces are kept in operation, and the maximum production level is attained. After the work from one furnace is quenched, two operators move to the next furnace, which is now ready for quenching, while the third operator reloads the first and removes the parts from the quench. The third operator, with



Two track-link bodies at a time are removed from the hardening furnace for quenching



Construction features of the Atmotrol muffle furnace indicate why it is quicker and cheaper to repair a batch furnace than a continuous furnace: *A*—silicon-carbide full muffle; *B*—flue-gas vent; *C*—over-firing tunner burners; *D*—stabilizing chamber for prepared-atmosphere gas entering muffle; *E*—refractory pier supports for muffle; *F*—under-firing tunnel burners firing between support piers; and *G*—refractory-lined double door with a limited opening for charging small parts

the help of the other two, also handles the draw-furnace operations.

By keeping the ninth muffle furnace as a spare, it is possible to maintain production in case one of the furnaces is down for repairs. The "down" unit is merely removed by a fork truck and replaced with the spare. Since all service connections are at a central point, the unit can be hooked up and readied for operation in a short time.

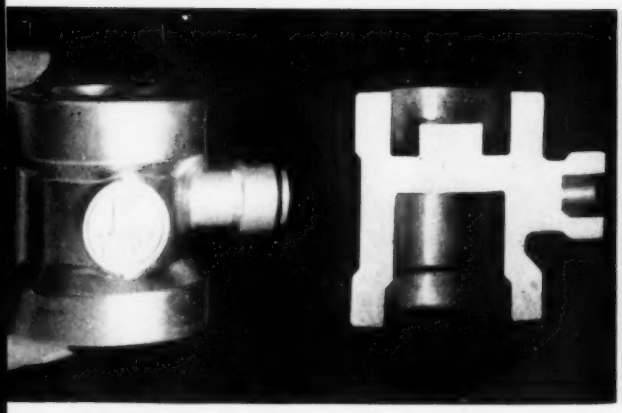
It is also possible by careful rotation, to predict when each furnace will require routine maintenance. The particular unit involved then can be removed from the line over the week-end and replaced by the spare unit with no loss to production.

Each Atmotrol furnace is equipped with a silicon-carbide muffle (effective internal dimensions 20 in. wide x 36 in. long x 10 in. high) to minimize scaling and decarburization. A MDX atmosphere generator of about 250 cfh capacity is placed adjacent to the furnace it serves. Inert atmosphere is produced by burning an air-gas mixture in the combustion chamber of the generator proper. Prepared atmosphere gas enters the furnace at the rear of the muffle. Here it is introduced to a stabilizing chamber formed by a baffle. This chamber serves to distribute the atmosphere uniformly by stabilizing and steadying its flow to the muffle.

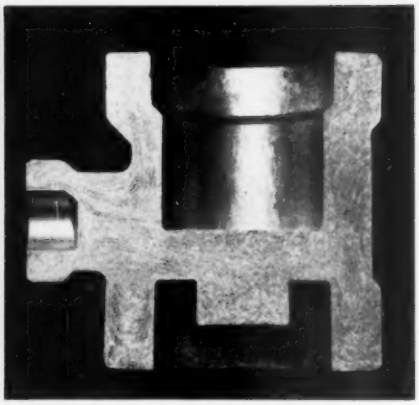
Burner Arrangement

Upon entering the heating chamber, gases travel the full length of the muffle and are discharged at the furnace front through an opening in the counterweighted door. Automatic - proportioning, one-valve-control burner equipment is utilized in each muffle furnace. Burners on one side of the furnace fire over the muffle, while those on the other side fire under the muffle. This arrangement protects both muffle and furnace refractories from direct flame impingement. All burners are self-cooling and fire into refractory-lined tunnels.

Oven type Forc-Aire draw furnaces have a heating chamber measuring 24 in. wide x 36 in. long x 24 in. high. This design incorporates a recirculating fan mounted in the rear of the furnace and an atmospheric burner firing upwards into a chamber in the furnace bottom. The fan produces rapid circulation of the heated gases, which results in a uniform temperature throughout the furnace charge. An average draw charge will include 96 track-link bodies stacked directly on the bottom grid of the furnace heating chamber.



Triple Cored Forging — Discharge head for Kidde fire-extinguishing systems is forged in mechanical press with split dies and movable cores. In this and most cored forgings, only one stroke of the press is required for the forging operation. Cores have no draft and only light finishing cuts are needed to complete the piece. Weight of the cored forging is 2.5 lb. Produced as a solid forging, this piece weighed 4.5 lb and total cost, including machining, was approximately 50% more than by present method



Metal flow—Lines of flow in etched section of Kidde valve follow characteristic forging pattern. Flow lines follow die contours and those of coring punches

CORED FORGINGS CUT PRODUCTION COSTS

Forgings cored without draft and accurate to ±0.005 in. now are being produced regularly in brass and other non-ferrous metals. Reductions in the weight of finished forgings run as high as 50% and subsequent machining is eliminated, or reduced to light finishing cuts

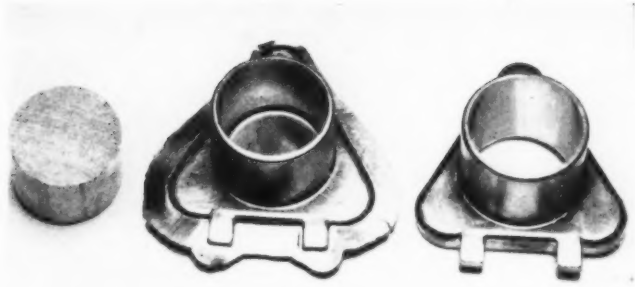
By MILES J. ROWAN
ASSOCIATE EDITOR
from interviews with
M. E. TULLOCH, President
C. J. PFEIFER, Vice President
E. A. BAINES, Production Manager
NATIONAL CORED FORGINGS CO., INC.
SOUTH NORWALK, CONN.
and
A. TOWART, Chief Design Analyst
WALTER KIDDE & CO., INC.
BELLEVILLE, N. J.

First produced in this country less than one year ago, brass forgings cored without draft now show attractive possibilities for cost reduction in a number of industrial applications. Thus far, solid forgings, castings, and screw-machine parts all have been produced to advantage as cored forgings. Dies also are being made at the present time to produce an item that formerly has been made from powdered metal.

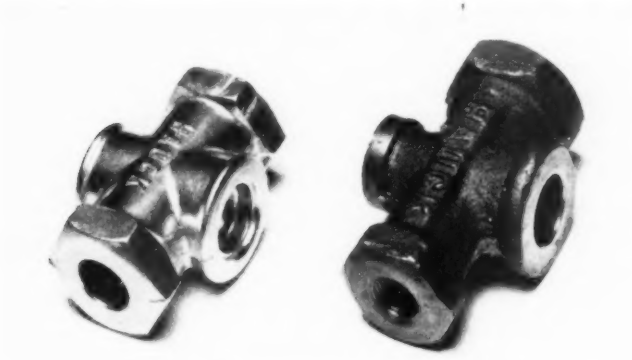
Savings in the cored-forging process come primarily from a reduction in the weight of material required to forge the piece and in the number of machining operations required to complete it. Tolerances of ± 0.005 in. can be held on all dimensions and cored holes can be produced without draft. While the majority of parts have been made from forging brass (ASTM Specification B-124 #2), other copper-base alloys can be used, and experiments have shown that both aluminum and titanium can be worked by this method.

While the process is relatively new in this country, it has been in use in England for a number of years and presses in National's plant were obtained from an English builder. Mechanical presses are employed with both 100- and 200-ton presses currently in operation and larger presses already on order to take care of plans for future expansion. Closed dies, either flat or split, and movable coring punches are required. Billets are heated to approximately 1550 F and are placed in between opposite halves of the die. After this, the press closes the die, and the hot, plastic-like brass is extruded within the die to conform to the details of the die. Only one stroke of the press normally is required to perform all forging work. The usual flash-trimming and cleaning operations then follow.

The main difference between flat and cored forging is in the appli-



Operation Sequence — Billet at left is heated to 1550 F, then is transformed in a single operation to forging at center. Trimmed and cleaned piece is shown at right. Weight of original billet is 0.714 lb. Completed piece weighs 0.656 lb, a loss of only 8% for flash and trimming of slug at bottom of cored hole



Sand Casting Replaced — Body for stop-cock now is produced by cored-forging process, overcoming porosity problem formerly encountered. Piece has four cores deep enough so a taper-drilling operation through the cored hole on the right side of the piece produces a 4-way opening in body

Less Machining Required — Lock parts are forged in split dies, with each piece located in its die in the same relative position as shown. Lock insides (right) fit within case (left). Case interior no longer requires broaching, formerly required when case was cast

cation of pressure to the billet. In flat work, the main pressure is exerted on the billet by closing the die halves, and the area of pressure is large. In cored forging the main pressure is exerted by a movable core, and the shape is produced by internal displacement of the billet throughout the die cavity. As the process basically is one of metal displacement, it requires high pressures in the die, and close timing of the operation of the dies and cores.

The weight of all billets must be controlled within close limits and in most cases the weight of the billets is only about 10% greater than the weight of the finished piece. In fact, over-all material losses for the plant, including bar ends and chips from cutoff, as well as flash and slugs trimmed from the bottom of cored holes, have averaged only about 14% during the past 8 months.

Each job must be analyzed to determine whether the required metal flow can be obtained and, if so, how the die should be designed. All dies are made by National after study of the nature and characteristics of the piece. Therefore, suggestions given in the accompanying box as to what features can be obtained in pieces produced as cored forgings are only a general guide to proper application.

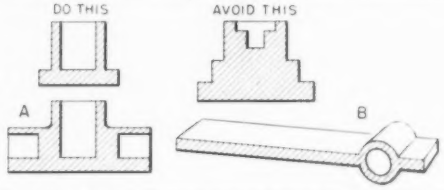
One of the first users of cored brass forgings produced in this country was Walter Kidde & Co., Inc., Belleville, N. J. A. Towart, who has been engaged full-time in cost-reduction work for the company, recognized the possibilities in the process and selected a component of Kidde built-in fire-extinguishing equipment to be produced as a cored forging (See picture at top of page). Made from forging brass, this piece is produced from a billet that weighs 42% less than the solid forging previously used. It requires only one machining operation and this is necessary only because present manufacturing methods call for machining this and another piece together. There is no draft on the

WHAT YOU CAN AND CAN'T DO IN NON-FERROUS CORED FORGING

It should be clearly understood that no general rules can be set up to determine in all cases whether a job can be produced by the cored-forging process. Each job must be analyzed individually to determine whether proper metal flow can be obtained. Primarily, this is a question of the size and shape of the piece in relation both to the pressures that can be developed in the press and the dies that can be designed for the operation. However, experience thus far provides a number of points that usually hold true and can be considered as general guides for proper application of the process. These will aid the manufacturing engineer in judging the practicality of changing over items in current production and also will help the design engineer in planning new items to take advantage of the process of cored forging.

1 Proportionate Cores

• Cores must be proportionate to the piece. As the billet must be displaced to fill the die, the cores must be large enough to do the work required. Pieces with small, disproportionate cores or with large flat surfaces generally are not well suited to the process. Shapes shown in Column *A* can be produced readily, those in Column *B* should be avoided.

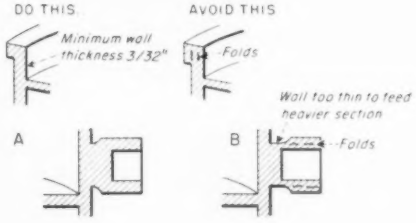


2 Wall Thickness

• Minimum wall thickness should be 1/10 in. as a good general rule. In some cases, however, 3/32 in. will be sufficient.

• Pieces should not have a section in their extremity that is heavier than the wall section feeding the extreme section. In such cases, material is restricted in flow, with the result that a void may occur in the extremity and die wear will be excessive.

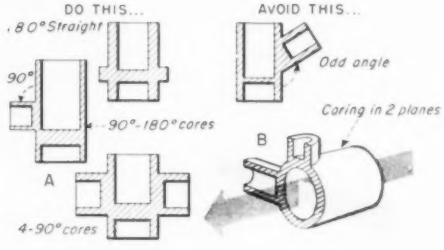
• Good practice is to keep the wall section constant throughout, but, if need be, it can be tapered to a smaller section at the extremity of the piece.



3 Coring Angles and Shapes

• Up to four cores in any single plane can be produced, provided all coring is done at right angles (or at 180°) to an adjacent core. Core centerlines can be offset somewhat. However, angles cannot be cored at any other degree unless secondary operations are applied.

• Cores need not be round in cross-section. A short section at the end of a core also can be of different shape than the main portion of the core. This, of course, should be smaller in diameter than the main core. Machining problems may be avoided by coring internal details.



4 Draft Angles

• Draft angles are not required on the cored depth, the outside surfaces of metal surrounding the cored hole, and the plane perpendicular to the core axis at the outside of the piece.

• Draft can be produced in cores, if desired.

• Back draft must be avoided.

5 Tolerances and Allowances

• All dimensions can be held within ±0.005 in. and any additional machining allowance that is desired can be produced. Present practice is to allow ±0.020 in. on flat surfaces and 0.040 in. on diameters.

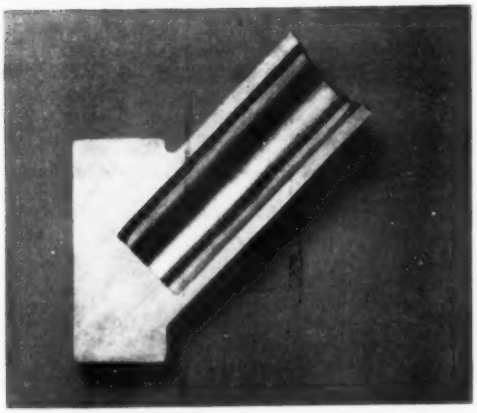
6 Finish Characteristics

• After trimming, forgings normally are bright-dipped. The finish is a smooth, fine-textured, hardware finish, which often is suitable for direct plating without further preparatory operations.

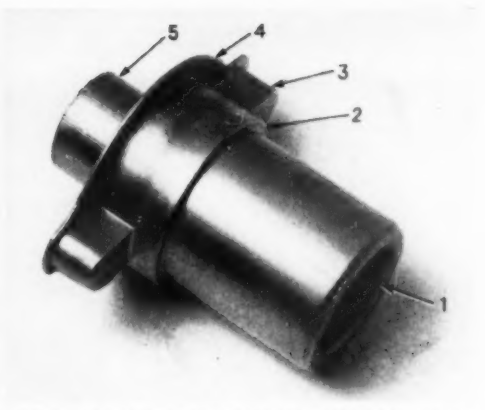
7 Forgeable Materials

• Forging brass (ASTM Specification B-124 #2) has made up the majority of the tonnage produced thus far. Naval brass and leaded naval brasses also have been forged.

• Copper, silicon bronze and aluminum bronze also can be produced by this method as simple cored forgings.



Angle Coring — Forging with cored hole at an angle to body is produced in two operations. Cored hole is 1¼ in. dia by 3¾ in. deep. Walls are parallel and of uniform thickness. Piece is partially formed in first operation and is finished in the second



Titanium Cored Forging — Test piece produced for experimental purposes illustrates five major operations that normally can be accomplished by the cored-forging process: (1) cored hole, (2) shoulder, (3) projections, (4) small flash, (5) reduced diameter of original billet

outer surfaces of the metal surrounding the cored hole and the outside diameter of this part actually is being held to a total tolerance of 0.004 in.

As these outside surfaces are produced without draft, no machining is required. This results in a better forging for two reasons. First, the tough outer skin of the forging remains undisturbed. While this is of less importance in a forging than it is in a cored sand casting or die casting, it is considered an advantage. The second and more important point to Kidde is that there are no tool marks on the surface, and consequently danger of stress concentration from this condition is avoided. Figures on this job show that the new cost is 42% less than the cost when the piece was produced without coring.

While this first piece was a relatively simple job requiring only one core, another component of the Kidde's built-in carbon dioxide system, the discharge head, is much more complex and requires cores from 3 sides. Produced in split dies, the cored forging weighs 2.5 lb, as compared to 4.5 lb as a solid forging. It now can be machined complete in a single chucking on a Goss & deLeeuw automatic where previously two separate machining operations were required. Approximately 0.060 in. on the diameter is removed in machining but experience thus far has convinced Towart that 0.050 in. would be ample. The greater uniformity in dimensional accuracy of cored forgings simplifies chucking and tooling problems and permits working to lower machining allowances than would be expected with sand castings or solid forgings. Savings on this job are approximately 33% of the former cost.

In addition to these and other Kidde jobs currently being tooled, cored forgings also have replaced sand castings in several cases. An interesting job on which development has just been completed, but one which involves security regulations, will replace a piece formerly made on a multi-spindle bar machine. Savings in critical material through reduction in scrap on this item will be considerable.

While the technique of producing cored forging still is extremely new in this country and much is being learned with each job undertaken, successful applications to date indicate that it has considerable potential in the whole range where material and machinery can be saved by coring.

"I know you're right, but I'm BOSS!"

HEAT TREATMENT... INSIDE OUT

Here's an ingenious way of stress-relieving large welded tanks when all welding must be done in the field

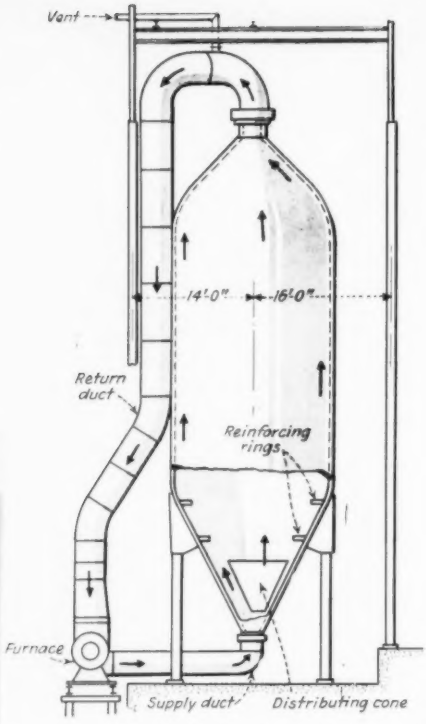
BY H. E. LINSLEY, ASSOCIATE EDITOR

Engineers at Dominion Bridge Co. Ltd., Lachine, Canada, were faced with an unusual stress-relieving heat-treatment problem in the construction of five large tanks. These units, actually sulfite digesters for a paper mill, were 60 ft long, and over 19 ft in dia, and although they could have been heat treated without difficulty in the plant furnace, they were too large to be transported by rail to their destination at Prince Rupert, British Columbia. To further complicate the problem, all welds were required to be X-rayed.

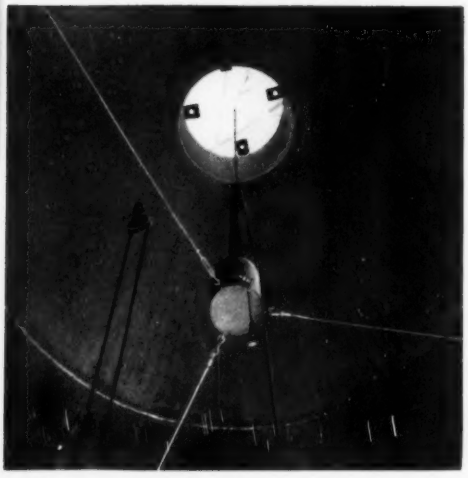
All welding, therefore, was done in the field, a total of over 16,850 lb of electrodes being used. For the X-rays, it was found impracticable to handle the 250,000-v X-ray machine, so a supply of Cobalt 60 was obtained from the National Research Council at Chalk River. This had a radioactivity equivalent to 2 grams of radium. It was housed in a special lead container so designed that it could be opened by remote control after positioning. Some 3000 films, 4½x17 in., were exposed during construction.

For heat treatment, an oil-fired furnace with a capacity of 3 million Btu per hr was set up near the base of the tank and connected by ducts to the upper and lower outlets. The outside of the tank was lagged with 4 in. of Rockwool. Furnace gases were forced into the bottom of the tank by a stainless-steel fan capable of handling 20,000 cfm of cold air when driven by a 40-hp motor. Gases returning from the top of the tank were fed back into the furnace intake.

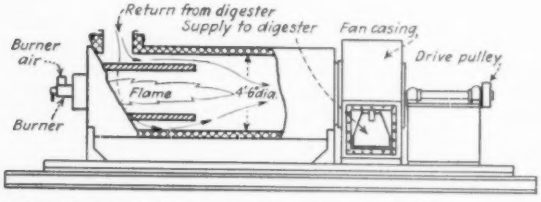
From starting the furnace, 13 hr were required to raise the shell temperature to the required 1100 F. This was held for about 1½ hr, and then the temperature slowly dropped to about 200 F. Total heat-treatment time was 32 hr.



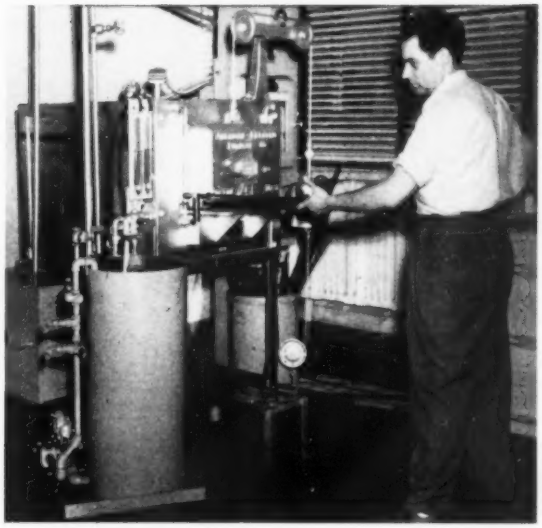
Stress-relieving setup with outside furnace. Temporary reinforcing rings were welded in place to prevent distortion, and offset distributing cone was inserted to insure proper heat distribution against the sides



Cobalt 60 container is lowered into tank for taking X-ray pictures of seams. Shielding is removed by remote control to make exposures.



Schematic layout of 3-million Btu oil furnace, showing arrangement of casing and fan. Fuel pump and primary air blower are driven off fan shaft



End-quench hardenability tests serve to check the characteristics of steels received and to discover if the steel mill allows variations between heats

How Metallurgical Control Solves Shop Problems

BY T. A. FRISCHMAN, Chief Metallurgist, Axle Div., EATON MFG. CO.

TEN sources exist for shop problems in metalworking plants. These may be defects or deviations in as-received barstock or forgings or in the materials used for heat-treating processes. Poor tool life can be traced back to materials or faulty heat treatment. Furnaces produce erratic results and need adjustment, maintenance, or repair. Mistakes arise because of poor instructions.

Any shop that does any quantity of heat-treating runs into these troubles from time to time. When work is off grade or difficult to machine, corrective steps must be taken quickly.

It pays to know what to do when emergencies arise, and how to set up a preventive-maintenance program too. Knowledge of metallurgy, possession of adequate testing equipment, and development of proper records are essential.

The practice of blaming shop problems on material or its heat treatment is unwise. Sometimes, the steel is "dirty" or it contains various kinds of defects. Furnace atmospheres or operation may be erratic. But there are plenty of cases where the faults can be attributed to cold working or bad grinding practice.

An impartial study by a production-minded person, preferably a metallurgist when the shop is large, is a sound approach.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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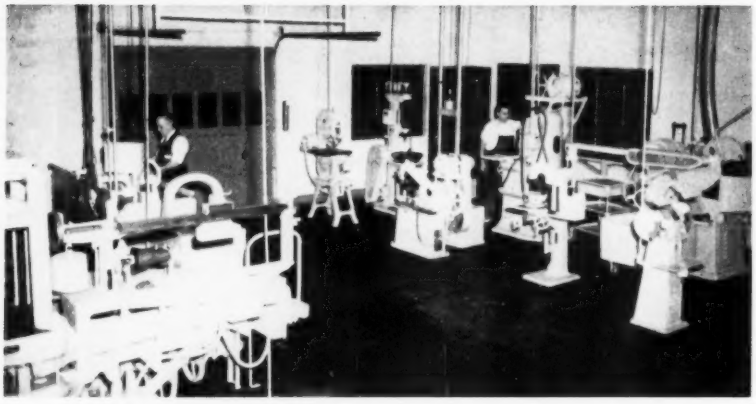


Sample preparation and testing section of the Metallurgical Laboratory, Axle Div., Eaton Mfg. Co., is well equipped for rapid determinations on either as-received material or parts giving trouble in processing

EFFECT OF SHOP PROBLEMS ON PRODUCTION

SPEED in solving shop problems is vital with large-volume production. Some problems are of such magnitude and severity that production stops altogether. When this happens, material in process behind the point of trouble begins to accumulate, and scarcities develop ahead of that point. Situations like these frequently introduce new problems of added complexity, and in turn lead to further deferral or curtailment of production. Quality of the finished product may be adversely affected. A large amount of scrap may be produced because often a process or processes must be kept going, in order to work out the solution for the difficulty.

There are other important reasons why it is essential to solve shop problems speedily. Earnings of workers, in many cases, depend upon the rapidity with which the correct answer is obtained. If the approach to the solution is too theoretical and requires a series of extended tests, considerable time may elapse before arriving at the answer, not only resulting in unemployment but loss in production also.

While speed has been stressed, accuracy is equally important. If the problem is only half solved, the same trouble, or a variant of it, is bound to come up again, perhaps at even a less desirable time. Thoroughness in correction procedure is usually well repaid by its effect on forestalling recurrence of the trouble.

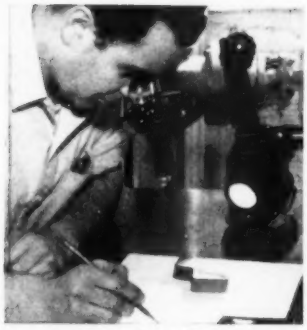
Increased Cost Aspects

Shop problems unquestionably increase production costs. That is why they should be solved quickly. The more critical the trouble, usually the greater the delay in getting things running again, because the whole problem generally is more involved. Costs are increased by: (1) direct loss in productivity, (2) extra labor and expense involved in correcting the trouble, (3) spoilage of work during the period of correction, and occasionally (4) cost of free field replacements as a direct result of the trouble.

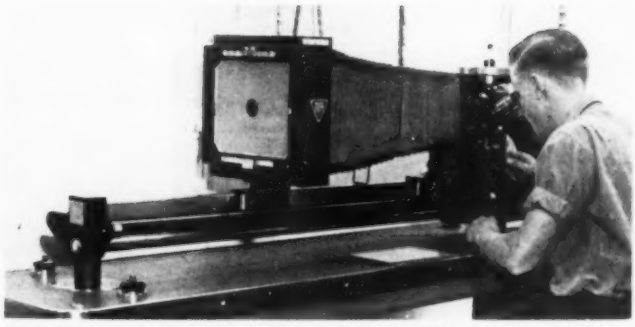
Role of the Laboratory

If a manufacturing plant has a metallurgical laboratory, solving of shop problems can be expedited and simplified. Much depends upon what role the laboratory personnel play in the plant organization. Metallurgical laboratories in in-

A chemical laboratory is required to check specifications



Porosity, grain flow, cleanliness and fracture characteristics of metals are examined with a low-power microscope that is easily manipulated



Microstructure and quality of metals is determined with a high-magnification microscope. The camera attachment makes it possible to record deviations from desired quality and prove to vendors that such variations did in fact exist

dustrial plants, as a rule, fall into two types: (1) research and development, and (2) production control. Some plants maintain both types; others only one.

The laboratory people may act only in an advisory capacity, suggesting or outlining the procedure to locate the source of trouble. They may also help in making an analysis, metallurgical or chemical, of the particular item that is causing trouble, *after having been acquainted with the problem.* On the other hand, the laboratory may be in on the problem from the very beginning and follow through with its complete solution, not interfering with the production supervisory personnel nor distracting them from their regular duties.

Geared for Action

Production laboratories usually play active parts in solving shop problems. Their personnel are primarily production-minded and take an aggressive part in the flow of products from beginning to end of operations. Frequently, this type of laboratory operates under the supervision of process engineers. With a set-up such as this, the personnel are pressed into service the moment anything interfering with production occurs.

ORIGIN OF SHOP PROBLEMS

SHOP problems originate from many sources. Some arise from neglect; others are unavoidable under the best operating conditions and control methods. Frequently, the problems are of such character that their origin is traceable elsewhere rather than to conditions in the plant where the trouble occurs. There are periods when relatively few problems are encountered. Then again, the opposite is true. In each case, the problem is usually solved, but the method of solution frequently differs considerably. With each solution, more and more experience is gained. This background in turn aids in solving further new problems.

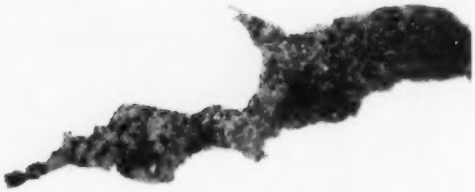
Upon analysis, shop problems in metalworking plants arise from the following sources:

1. Defects or shortcomings in materials for fabrication.
2. Irregularities or deficiencies in supplied material or its further processing.
3. Improper operation and poor maintenance of fabricating equipment.
4. Unavoidable breakdowns of equipment.
5. Improper tooling methods and machining practices.
6. Irregularities in process procedures.
7. Errors of commitment and judgment.
8. Deficient or insufficient instructions.
9. Deviations and use of substitute materials.
10. Dimensional characteristics of the part being manufactured.

Problems with Fabricating Materials

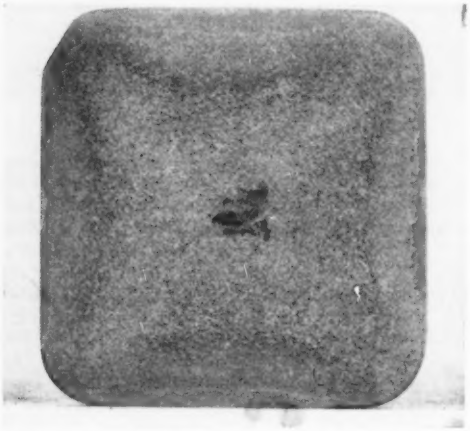
Much too often, materials are wrongfully suspected as being at the root of trouble. Unless this mistake is avoided, valuable time and productivity will be lost. Quick recognition of the offending defect or shortcoming is not always easy. Many obscuring factors may exist. Small visible defects readily identified in steel are surface seams or large slag inclusions. Variable grain size, wrong microstructure, excessive decarburization virtually require laboratory investigation.

Defects related to conditions existing during the primary steel-mill operations are: alumina-stringer type inclusions, refractory type inclusions, internal cracks, laminations, excessive porosity, pipe or insufficient croppage, in-

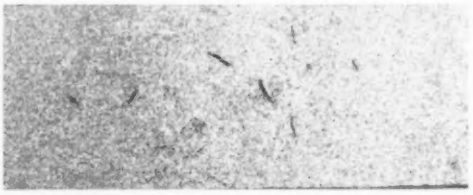


Refractory-type inclusions, as found in an alloy-steel ring gear, are harmful to cutting-tool edges

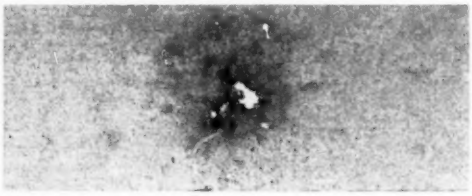
Alumina stringers shorten tool life, prevent fine finish, and may cause rejection during inspection. X100



Insufficient croppage of a 4x4 in. alloy steel billet carried over non-metallic inclusions from ingot bottom

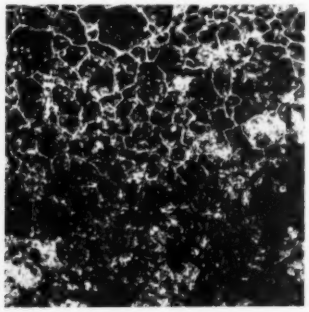


Internal ruptures (flakes), as seen in a chrome-moly billet at X100, reduce quality of parts



Pipe, or a cavity formed during the contraction of the last part of the liquid metal in the ingot, might be carried over

ternal seams, mixed grain size, decarburization, poor surface condition, off-grade chemistry, and improper hardenability. Trouble arising from them usually shows up in the machining or in the heat-treating operations in fabricating the steel. Troubles like these frequently aid in screening out defects before the part is ever completed and put into service.



Mixed grain size in hyper-case region causes heat-treating trouble

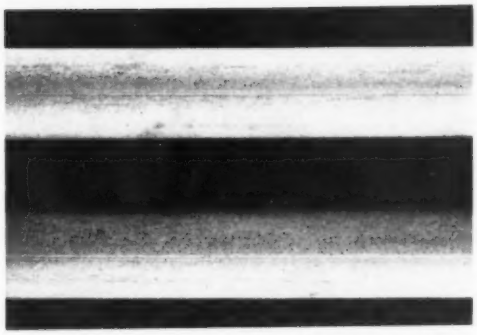
Refractory-type inclusions dull, break or chip the cutting tool. No heat treatment will eliminate or soften this type of defect. Heavy concentrations of alumina stringer-type inclusions also reduce tool life, require frequent regrinding, but rarely cause tool breakage or chipping. This type of inclusion is frequently the cause of rejection of parts subjected to non-destructive testing methods.

Other kinds of defects mentioned, as related to primary steel mill operations, cause trouble in finished parts from a physical property and quality standpoint. Internal ruptures, pipe, insufficient croppage, laminations, and excessive porosity lower the quality of a part in respect to reduction of area, elongation and tensile strength. Reduced mechanical properties, in turn, are frequently reflected in poor bending, forming, drawing and swaging qualities, particularly at room temperature.

Mixed grain size and off-grade chemical composition show up in heat-treating operations by causing irregular hardness, cracking and distortion. Troubles of this nature are often serious enough to reduce production and even make scrap parts. Inherently poor steel quality might be overlooked as the source of the trouble, and in the resulting confusion the heat-treat procedure or practice might be questioned and even altered unnecessarily. When troubles like this arise, it is a good point to check the steel for deficiencies before getting too excited about

Seams in bars occur in rolling, and are difficult to detect when the product is heat treated

Failure from a seam. In heat-treatment, seam developed into a quench crack and service stress caused breakage



Guide or roll marks usually have a wider gap than seams but generally are not as deep

whether the heat treatment was performed satisfactorily.

Other defects in steel give trouble in fabrication, especially where the mill finish is not removed. In this category are defects that originate in rolling mills during conversion of large primary steel sections to smaller bar sizes. Among these defects are: decarburization, roll marks, seams, slivers, overfills, underfills, laps, checking and pitting. Others are: oversize and undersize, eccentricity, bad bar ends, scale pits, lack of straightness, etc. Detecting these defects is more critical when parts are fabricated directly from the bars as compared with parts made from forgings. A forging operation helps at times to eliminate some of these defects.

Seams

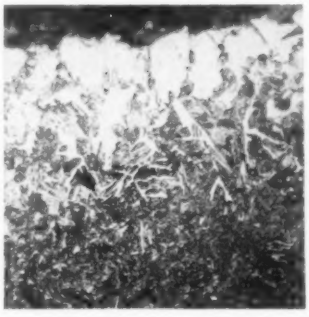
The seam is simple to identify, especially by magnetic-particle inspection, in the as-received steel bar. Its identification, however, after heat treatment is more difficult. In the heat-treated stage, a seam in the surface of a part is sometimes interpreted as a quench crack. Examination under relatively high magnification is sometimes necessary to identify the real character of the defect.

A seam usually shows very little gap between its sides. Also, it is generally straight in the rolled steel bar. It frequently can be confused with a roll mark or scratch, which also is straight but usually exhibits a wider gap between the sides. A satisfactory method of ascertaining how deep the defect extends is to file it down at right angles to its length until the dark crevice or line disappears from the file groove.

If seams are not too deep, they do not cause much trouble, because they disappear if the part is ground or machined. But if seams are not removed and the member is subjected to torsion or bending stresses, the depth of the seam usually grows and may eventually cause the part to fail.

Mixed Grain Size

Shop problems arising from mixed or non-uniform grain size of steel are generally confined to heat-treating operations. This non-uniformity is also termed "variable" or "duplex." It is an inherent characteristic of the heat of steel, and its origin is traceable to the steelmaking practice used. Its occurrence, however, is more the exception than the rule. Steel of this sort can neither be classed fine-grained nor coarse.



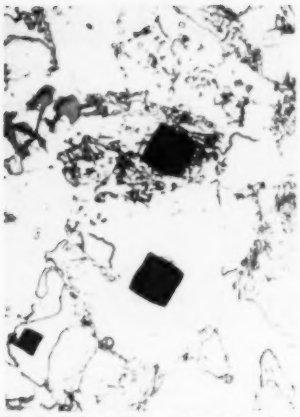
Decarburized barstock, revealed by free ferrite (white areas) causes erratic surface hardness in heat treating. X250

Grain coarsening temperatures may vary from heat to heat of steel. Some heats of steel coarsen at temperatures as low as 1550 F., whereas others will remain fine-grained at temperatures as high as 1900 F. Any steel that tends to produce non-uniform grain growth at customary hardening and carburizing temperatures may be expected to give trouble in the heat-treating operation.

Variable grain size causes non-uniformity in hardness and irregularity in the mechanical properties of heat-treated parts, particularly in regard to ductility and resistance to impact. Increasing the austenite grain size delays both the start and completion of transformation.[1] Therefore, if the parent austenite varies in grain size at quenching, the microstructures formed by the transformation will likewise vary accordingly, as might be expected.

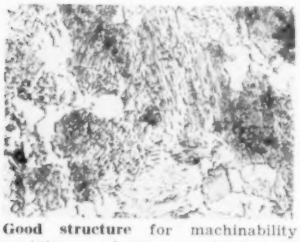
If little distortion can be tolerated, mixed grain size becomes a serious problem. The steel hardens non-uniformly, thus setting up uneven strains which result in warpage. Carried farther, the non-uniformly strained conditions may even lead to ultimate cracking as

[1] E. S. Davenport, R. A. Grange and R. J. Hafsten, "Influence of Austenite Grain Size upon the Isothermal Transformation Behavior of SAE 4140 Steel." *Trans* AIMME Vol 145 —1941.

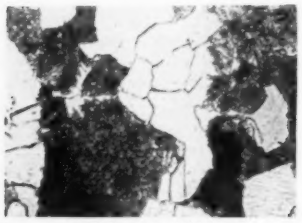


Black indentations represent micro hardness tests of constituents in bearing cap. Brinell hardness tests were unreliable to determine machinability

Residual martensite, the acicular gray-appearing constituent in as-rolled SAE 2515, reduces tool life



Good structure for machinability contains equal amounts of spheroidized pearlite and lameller pearlite, plus ferrite. X500



Poor machining qualities are produced by a structure consisting of sorbitic pearlite and large-grained ferrite, although Brinell is 207

a result of stresses developed within the quenched part.

Generally, mixed grain size aids machinability, where fine-grained steel is ordinarily used. This evidently is due to the presence of the larger grains which machine more freely than smaller ones.

Improper Microstructure

Improper microstructure of steel bars, forgings and castings is the cause of many shop problems. Besides causing erratic hardness and unsatisfactory mechanical properties, improper microstructure is frequently the cause for poor machinability. Not all plants have access to a microscope to check the microstructure. They rely on hardness testing machines to help solve the machining problem. But, it is possible for materials to be within the prescribed limits for hardness yet vary widely in microstructure as a result of thermal or mechanical treatment.

A striking example of such a situation recently occurred. Trouble developed in drilling a differential bearing cap made from pearlitic malleable iron. As measured by the standard Brinell test, the hardness was within the hardness tolerance. Examination of structure under the microscope revealed improper malleablizing and heat-treating practice. The structure consisted of very little graphite, considerable cementite, ferrite and pearlite. When each micro-constituent was checked for hardness with a Bergsman Microhardness tester, it was easy to see why machining troubles were experienced. The carbide phase or cementite was found by conversion to be Brinell 946, the ferrite, Brinell 187 and the pearlite, Brinell 217, yet the composite hardness as measured by a regular Brinell tester was only 207! Without a microscope or the microhardness tester, it would be virtually impossible to figure out what was causing the trouble.

Decarburization

Surface decarburization of incoming materials may cause trouble in any one of several ways. In heat treating, erratic surface hardness is produced, if the regular stock removal is less than the depth

Wyman-Gordon Co.

Forging lap and inclusions in gear forging affected life of tools and product strength

Forging lap in aircraft propeller shaft grew into a quench crack in the hardening operation

to which the decarburized zone extends. Ferrite, the white constituent in the decarburized zone, is unhardenable by thermal treatment. It has been known to cause cracking of tools made from high-speed steel. Decarburization is especially undesirable in high-quality bolt threads, or on pins which require high surface hardness to resist abrasion and wear. If the defect arises in this manner, the shop problem is not one so much of processing but rather one of experiencing a shortage of parts for assembly.

Poor Surface Condition

Poor surface condition of as-received materials accounts for a substantial percentage of shop problems. The surfaces may be badly pitted or may contain any one or several of the different kinds of surface defects previously mentioned. Occasionally, forgings give machining trouble if hammered-in scale, or hard shot, from the blast cleaning operation is embedded in the surface. Another source of trouble arises from laps and shear cracks, which contain oxidized sur-

faces harmful to cutting edges of machine tools.

Poor tool life is frequently caused by sand burning in at the surface of castings. Slag embedded in the surface and oxidized voids also reduce tool life.

Off-grade Chemistry

Prior to the advent of guaranteed hardenability of common constructional alloy steels, off-grade chemistry was more of a problem than it is now. Hardenability of heat-treatable steels is usually known or can be determined in advance of heat treatment. Thus, if any one or more of the chemical elements is outside the specification, the steel can still be used if it meets the hardenability requirement, but special attention during heat treatment usually becomes necessary.

Occasionally, even though the hardenability of the steel may fall just within the band limits, a particular combination of elements may cause shop troubles in various ways:

1. In annealing to within the desired range of hardness for machining.
2. Too large a differential in hardness between thin and thick sections of the part.
3. Cracking in the quench.
4. Excessive distortion.
5. Formation of high percentages of retained austenite upon direct quenching from the carburizer.

If heat treating and the development of certain specific mechanical properties and hardness are not involved in the shop operations, off-grade chemistry and borderline hardenability are not too serious.

Process-Supply Materials

Materials that are used in various heat-treating processes for fabricating constructional materials may be called "process supply materials." Typical examples are: (1) solid carburizing compounds, (2) liquefied gases, (3) heat-treating salts, (4) quenching oils, (5) heat-resisting alloy materials, (6) blasting materials, (7) cleaners and detergents. When materials vary in uniformity and age not supplied in accordance with their applicable specification, they become a source for various kinds of trouble. Characteristics of these materials, like those of fabrication materials, are outside the user's control. Therefore, it is advantageous to set up a suitable incoming-materials testing program to prevent use of materials that are potentially sources of trouble.

Improper operation and poor maintenance of fabricating equipment was put third on the list of major sources of shop difficulties. Under "fabricating equipment" can be put such facilities as heat-treating furnaces, oil conditioners, cleaning machines, hardness testers, machine tools, quenching tanks and presses, protective-atmosphere generators, and furnace accessories. Improper operation of these kinds of equipment is not always intentional, but arises from poor preventive maintenance.

Continuous Operation

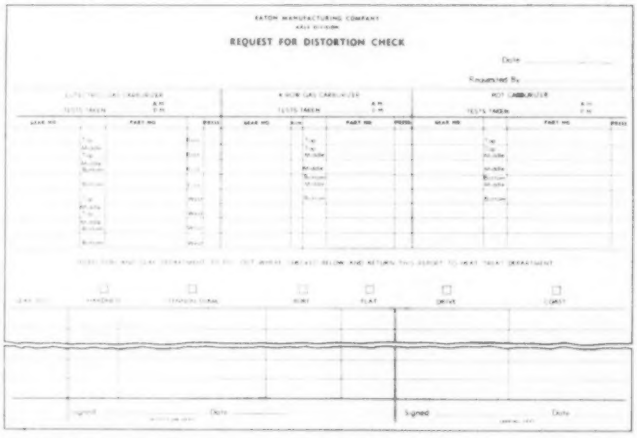
Continuous operation of heat-treating equipment causes wear, warpage and destruction of component parts. In furnaces, internal parts are subjected to high loading stresses, generally at high temperatures. Furnace parts and brickwork are subjected to repeated thermal shock and the deteriorating effects of hot reactive gases. Failure takes place due to excessive growth, deterioration and rupture of the furnace parts.

Quench-oil conditioning systems become fouled and inefficient. If not properly maintained, they introduce quenching irregularities. Contamination of quenching oil with water creates frothing, uneven cooling and the possibility of parts cracking during quenching. Disposal of poisonous cyanides from cyanide salt baths and from cyanide-copper plating baths must be in accord with local ordinances or state regulations. The same can be said for disposal of corrosive acids from pickling solutions. And the shop must combat leakage and corrosion in equipment where solutions are used.

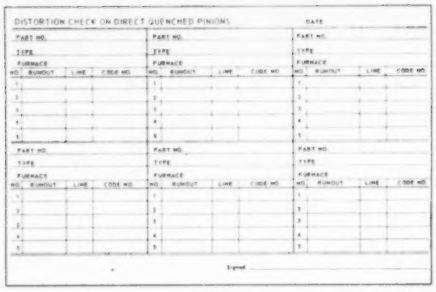
Self-Destructive

Sand- and shot-blasting machines and tumbling machines are destructive of their interior parts. Rapid wear is certain unless the machines are properly maintained with specified coating materials, such as rubber and hard-facing alloys.

Many heat-treating problems are caused by improper performance of furnace accessories like fouled gas or oil burners, eroded burner blocks, clogged air blowers, improper functioning of regulators and governors, sticking control valves, inaccurate gages and poor pyrometer performance. Regular


REQUEST FOR DISTORTION CHECK

Periodic distortion checks serve two purposes: (1) to keep an eye on the quality of work produced, and (2) to learn how the heat-treating equipment is functioning in relation to requirements


DISTORTION CHECK ON DIRECT QUENCHED PINIONS

DATE

PART NO.
TYPE
FURNACE
NO. RUNOUT LINE CODE NO.

Signed

Distortion - report form for drive pinions, like the one for drive gears, aids in discovering whether heat - treating furnaces need maintenance or repair

inspection and frequent maintenance are required. Also, unless control of protective-atmosphere generators is exercised, and their operating mechanisms are properly cared for, troubles of serious consequence will develop.

Quenching Troubles

Another source for trouble is in oil-quenching facilities. Carelessness in making quenching-die setups, not replacing worn parts, allowing spray nozzles and parts to become plugged with solids, and sludge accumulation in bottom of tanks and water contamination are some of the conditions that lead to frequent trouble.

Unforeseen and unpredictable breakdowns of processing equipment, power failures and interrupted gas supply can upset the plant. Work is sometimes spoiled by scaling or becoming badly decarburized in controlled-atmosphere furnaces when such emergencies arise. When handling protective-gas atmospheres, fast but accurate thinking is needed under these conditions to avoid injury to personnel and damage to plant equipment by explosion or fire hazard. Unavoidable breakdowns frequently make necessary the use of other equipment not as well suited to the type of process as the regular equipment. Because of these conditions, quality is at times unintentionally reduced below reduced requirements.

Situations arise during machining that to all appearances suggest that the steel or its heat treatment are at fault. It is natural for machine operators and supervisory personnel to suspect the material rather than cutting tools or machine performance. Make an unbiased study of all possible contributing factors, both mechanical and metallurgical. It frequently happens that new angles to the solution of the problem are uncovered. As a result, better tooling methods, revised feeds and speeds, needed machine repairs, better heat-treating practices and other improvements are found.

IRREGULARITIES IN PROCESS PROCEDURES

Shop problems attributable to irregularities in processing procedures can become numerous unless good process controls are put into effect. Poor copper-plating technique allows carbon to penetrate areas where it is unwanted during carburizing. Lack of precision in heat-treating methods leads to inferior metallurgical properties. Inadequate case-depth control is reflected in poor service performance of a part. Lack of control of furnace atmosphere, carrier-gas generators, cyanide content of carburizing salt baths, annealing cycles and related processes, eventually lead to shop troubles during manufacturing and later on to inferior quality in finished parts.

Deviations from the use of regularly specified materials in emergencies likewise introduce shop problems in that special handling and different processing oftentimes become necessary. One way of systematically handling authorized deviations on incoming materials is by issuing a deviation authorization form. Poorly worded instructions, or the complete lack of them, lead to difficulties. Disregard for instructions, even though clearly given, unquestionably invites trouble and should not be tolerated.

Solution of Shop Problems

Obviously, correct appraisal of a shop problem is the first step to its solution. Its exact nature should be definitely established as quickly as possible. Ask whether the fault has occurred previously and how often. If good records were kept of how the problem was approached on former occasions, the solution is hastened and simplified. Records may be compiled in a card file arranged by part names. If trouble again develops with the same part, review this file. The same basic problem may have re-occurred or it may have appeared in a variation.

Appraise shop problems in regard to their degree of importance. Possibly, production should be stopped. On the other hand, a minor irregularity may excite an operator's curiosity and influence a request for study of the problem. Before undertaking any work, the investigator should discuss the situation with the department supervisor.

Thoroughness in investigation is mandatory. The competent investigator adopts a tolerant attitude. He listens to all details, even ones seemingly irrelevent, to glean as much information as possible. He determines if any unusual circumstances prevailed, and if instructions or specified procedures were followed. He makes special effort to find if any part of the prescribed procedure had been changed purposely or unintentionally. The last is particularly important because irregularities in procedure account for many shop problems that arise. Major problems are usually easy to diagnose. The obscure or minor irregularity causes the most trouble.

After diagnosis of the nature of the problem, a plan for its solution should be formulated and followed.

Simplify the program as much as possible. Above all, make it practical rather than too theoretical. Next, notify everyone involved, to secure their cooperation.

One of the first steps is to check the operations involved. See if they are performed according to standardized procedures. If variation in procedures are not found, the chances are that materials, either that from which the part is made or those used for processing, or the equipment, are at fault.

Trial Runs

In making trial runs to reveal the source of trouble, hold variables to a minimum. Usually only one condition or factor is permitted to vary. Suppose a complaint about poor machinability was made on a given lot of annealed forgings. If another lot is annealed as a check against the first, conditions during the second run must be the same. That is, the annealing temperature,

EATON MANUFACTURING COMPANY
AXLE DIVISION
METALLURGICAL DEPARTMENT

WORK REQUEST REPORT

NO. 2301

TO: C.M. Vollmer — Date: 9-19-50
CC: — Requested By: T.A. Frischmann
Vendor — Assigned To: D.C. Wickson

Part Name	Part No.	Model	Lab. File
Bevel drive pinion	21292	1350	Routine Control test

Reason for Request:
Routine metallurgical examination of a randomly selected production part gas carburized in Surface Combustion continuous carburizing furnace No. 25.

CHECK FOR THE FOLLOWING

TOOTH HARDNESS — CASE: File hard, Rc 62 — CORE: Center Rc 36, Base Rc 31

HARDNESS: Surface, 1/2 Radius, Center

CHEMICAL: Heat No. 23589; Code M-1; Source Copperweld; Type 4817H

MICRO: Micro. No. 1045-A; Longitudinal; Transverse; Case Depth .064; Grain Size 5-7

END-QUENCH HARDENABILITY (IN 1/16ths)

1	42	5	34	10	–	20	
2	–	6	–	12	22	24	
3	40	7	–	14	–	28	
4	–	8	26	16	20	32	

VENDOR EATON

C	.16	.17
Mn	.51	.53
Ni	3.55	3.49
Cr	–	–
Mo	.24	.22

ADDITIONAL CHECKS: Tensile; Fracture; Etch; Other

Steel Data Card #2242

Specifications: AISI 4817H steel Spec. No. 1
Bevel teeth to be file hard to an American Swiss narrow pillar file, #0 cut. Case depth .050 - .065.
Markings: 23492 6-38 M-1 48 Eaton

SKETCH

Remarks: This pinion was loaded into the furnace at 7:25 p.m. 9-15-50 on line No. 2 and came out at 8:30 a.m. 9-16-50. The pinion was placed in the center row of pinions on the south end of the fixture. Oil valve on the incoming line of the quench tank was open 1-1/2 turns. The circulating pump line valve was open seven turns. 40 minute push. #1 zone 1660 F., #2 zone 1700 F., #3 zone 1650 F.

Conclusions: Teeth are file hard. Rockwell hardness of C 62 on stem bearing is satisfactory.

Case microstructure is approximately 90% martensite - 10% austenite. No excess carbides present in the case. Gradation zone is satisfactory. Total case depth .064. Core is in good solution, consisting of bainite and low carbon martensite.

The metallurgical characteristics of this pinion meet the production standards.

Form A-226 (Rev. 5-50)

Deviation Authorization
EATON MANUFACTURING COMPANY
AXLE DIVISION 739 EAST 140th STREET
CLEVELAND 10, OHIO

TO — EATON MODEL — DATE
QUANTITY AUTHORIZED — PART NUMBER — DESCRIPTION — PURCHASE ORDER NO.

THIS AUTHORIZATION TO APPLY ON SPECIFIED QUANTITY OF MATERIAL COVERED BY ABOVE PURCHASE ORDERS ONLY.
AUTHORIZATION IS HEREBY GRANTED TO DEVIATE FROM EATON STANDARD PRACTICE OR BLUEPRINT SPECIFICATIONS BY MAKING FROM OR FURNISHING

ALL OTHER SPECIFICATIONS TO REMAIN THE SAME AS BEFORE.
THE ABOVE IS A DEVIATION FROM EATON STANDARD PRACTICE OR BLUEPRINT SPECIFICATION WHICH IS

ANALYSIS AND HARDENABILITY OF SUBSTITUTE MATERIAL — HEAT NUMBER — MILL — GRAIN SIZE

C	MN	P	S	SI	NI	CR	MO

END-QUENCH HARDENABILITY (IN 1/16 INS)

1		5		10		20	
2		6		12		24	
3		7		14		28	
4		8		16		32	

REMARKS AND REASON FOR AUTHORIZATION:

PRICE AFFECTED TO THE FOLLOWING EXTENT:

EATON INTERNAL INSTRUCTIONS — DOES THIS CHANGE AFFECT OUR HEAT TREATING DEPARTMENT? ☐ YES ☐ NO

TO BE USED FOR: ☐ REGULAR PRODUCTION ☐ SERVICE ☐ SPECIAL — REQUESTED BY: — AUTHORIZED BY:

COPIES FOR: Vendor, Metallurgical Lab, Heat Treat, Inspection (2), Production, Superintendent, Engineering, Purchasing

EATON MANUFACTURING COMPANY

PER

Signed D.C. Wickson

Solutions of shop problems are aided by good records of previous troubles. File records by part name. Then, if trouble again develops with the same part, it is possible to get data which will aid accurate diagnosis and a speedy solution

Deviations from regularly specified materials may require special handling and different processing. A suitable form apprises all persons concerned with the details, avoids misunderstandings and supplies a complete record

soaking time, cooling rate, load density and other factors will all have to be duplicated exactly in order to draw valid conclusions. If the cause of error is not now apparent, one factor at a time should be varied to find the reason.

If it is established that neither fabricating or processing materials are at fault, then the materials vendor should be called into the picture. All facts pertaining to the findings should be made available to the vendor, and samples kept. Recorded results carry more weight than claims and usually stimulate the vendor to take corrective steps to end the trouble.

SOLUTIONS FOR TYPICAL HEAT-TREATING PROBLEMS

Problem A

Were deep pits in surface of steel forgings caused originally by forging vendor as a result of over pickling hammered-in scale or were they caused by purchaser's own pickling operation?

Circumstances — Purchaser bought the forgings scale-free in the acid-pickled condition but not annealed. Forgings were annealed and pickled in the purchaser's plant.

Solution — Since the purchaser performed the annealing operation in a direct-fired furnace, the entire surface area of the forging should show some evidence of decarburization. Micro-examination of the edges and particularly the bottoms of the pits revealed no such evidence. This would indicate the purchaser over-pickled the forging because a normal pickle would not remove sufficient metal to remove decarburization completely.

Problem B

Why did tools dull rapidly in drilling and spot facing a hole in pearlitic malleable castings, whereas other machining operations remote from the hole gave no such trouble?

Circumstances — Castings were supplied on the basis of a Brinell hardness of 170 to 217. No significant difference was found between the Brinell hardness at the surface where the hole was drilled or at other locations on the casting.

Solution—Micro-examination of the surface where the hole is drilled showed a hardened zone about 0.018 in. deep. Rockwell hardness of this surface was C 43. The Brinell test did not reflect the shallow layer of surface-hardened metal. Cause for the hardened layer was traced to severe grinding of the casting during conditioning. Sufficient heat apparently was generated to raise the temperature of the surface above the re-solution point of the carbide, thus causing the surface to harden by the chilling effect of the underlying metal.

Problem C

Did surface imperfection of finished bearing race originate from corrosion or from non-metallic inclusions in the steel?

Circumstances — Finish-ground bearing races were rejected because of very small surface imperfections. It was important to determine whether the steel maker or the fabricator was at fault.

Solution—Micro-examination of the edges of the imperfection showed no signs of non-metallic inclusion. The bottom of the im-

EATON MANUFACTURING COMPANY
AXLE DIVISION
METALLURGICAL DEPARTMENT
NO. 27

WORK REQUEST REPORT

TO: Superintendent — Date: 5-17-49
CC: Heat Treat — Requested By: [illegible]
Vendor — Assigned To:

Part Name	Part No.	Model	Lab. File
Differential Bearing Adjuster Lock	47491	22501	Diff.Brg.Adj. Locks

Reason for Request: Determine cause of drilling difficulties. Drills were dulling prematurely. Locks were annealed in continuous annealing furnace No. 43. Type steel SAE 3140, allowable alternate for SAE 8640.

CHECK FOR THE FOLLOWING

TOOTH HARDNESS — CASE: File, Rc; CORE: Center Rc, Base Rc
HARDNESS — Surface, 1/2 Radius, Center
CHEMICAL — Heat No., Code, Source, Type; VENDOR EATON: C, Mn, Ni, Cr, Mo
MICRO — Micro. No., Longitudinal, Transverse, Case Depth, Grain Size
ADDITIONAL CHECKS — Tensile, Fracture, Etch, Other

END QUENCH HARDENABILITY (IN 1/16ths)

1	5	10	20
2	6	12	24
3	7	14	28
4	8	16	32

Specifications: Finished hardness brinell 375-461 SAE 8640 steel.
SKETCH
Markings:
Remarks:

Conclusions: A Brinell hardness of 229 was found which indicates furnace No. 43 has a cooling rate too fast for SAE 3140 steel to develop the proper structure for good drilling properties. A 1200 F. temper after this anneal reduced the Brinell hardness to 217. Some improvement in drilling resulted but not enough to remedy the trouble.

The remaining locks were reannealed in the continuous cycle Annealing Furnace No. 24, which has a slower cooling rate than Furnace No. 43, comparable to a full anneal. This treatment developed a Brinell hardness of 197 on the locks and eliminated further drilling troubles. Henceforth all locks made from SAE 3140 material will be annealed in Furnace No. 24.

Date Completed:
Approved: _____ Signed: _____
L.A.K. Frieman

Work progress reports can be used for other purposes than analyzing trouble after it has occurred. As used here, the form is a routine test to find out if trouble is in the making or the process is being carried out properly. This report supplements determinations of case depth, dewpoint, carbon concentration and gas analysis

perfection terminated in a white appearing ferrite band showing part of the band as being corroded away.

Problem D

What caused decarburization of direct-quenched carburized parts when the dewpoint and chemical composition of both the carrier gas and the furnace atmosphere were normal in a large continuous type gas carburizer?

Circumstances — A slight skin softness occurred from time to time on the carburized parts. Case depth and underlying microstructure were satisfactory.

Solution — A different draft gage was connected to the furnace chamber to show how each mechanical sequence, such as door openings, charge car travel, push-ins and push-outs affected the furnace pressure. One negative pressure reading was found in the series of readings taken. This would indicate that air entered the furnace chamber, when the charge car moved outward to the charge vestibule of the furnace, thus causing a pressure drop. At the same time, the automatic sequence of operations provided for opening the inner sealing discharge door on the opposite end of the furnace, thus allowing air to be pulled in past the outer loose fitting door. By merely changing the sequence of the operations to delay movement of the charge car, the negative pressure or vacuum inside the furnace chamber was eliminated and decarburization disappeared.

Problem E

What caused the puller-end of a HSS broach to break off suddenly after being in use only a short time?

Circumstances—The puller-end was tempered back properly to develop sufficient toughness. A number of nicks, however, were visible in the vicinity of the fracture, suggesting that the broach had been dropped several times.

Solution—Study of the fracture area revealed a sharp re-entrant angle. Examination at a magnification of fifteen diameters revealed that the nicks had been put into the broach when made. This conclusion was reached upon finding the surfaces of the nicks grit-blasted and dull. If the surfaces had been nicked after grit blasting, they would have a shiny indented appearance. It was later learned that the broach had been nicked by the broach manufacturer during the straightening operation. Failure was ascribed to the sharp fillet. A larger radius in the fillet eliminated further trouble.

Problem F

Did diametrical cracks in the end of hardened and tempered axle shafts originate from high hardenability steel or from defects in the steel?

Circumstances — Shafts were made from deep-hardening, medium-carbon alloy steel. They were oil quenched, removed from the oil while still hot and tempered immediately afterward. No discrepancies in heat-treating operations could be found.

Solution — Use of micro-examination appeared to be the only way this problem could be solved. If edges of the crack showed decarburization at the surface and inward along the path of the crack, the opening existed before exposing the shafts to the decarburizing atmosphere of the hardening furnace. If, however, the edges of the crack exhibited no carburization, it could be concluded that the crack developed during the quenching operation or possibly afterwards.

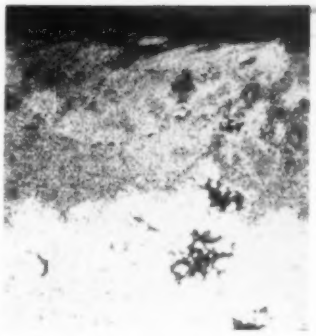
Micro-examination of the crack revealed decarburization along its edges, indicating definitely that it originated from a shear crack traceable to the forging operation. The defect acted as a focal point for the start of cracking.

Problem G

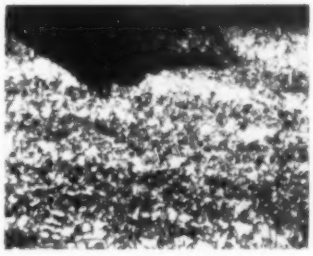
What caused premature wear of the thrust end of carburized and hardened rollers, which were within the specified Rockwell C hardness range?

Circumstances—Ends of the rollers were ground after carburizing, hardening and low-temperature tempering. Stock removed was held to a minimum, because of cost and a critical shortage of grinding facilities.

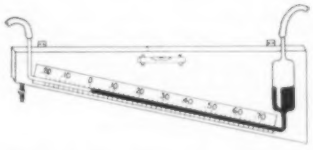
Solution—It was discovered that the ends of the rollers could be



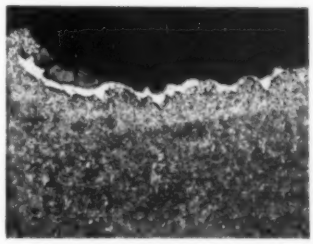
Darkened area represents rehardened zone of severely ground pearlitic malleable castings. X 75



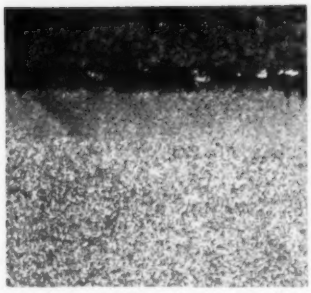
Corrosion pit in bearing race was revealed by micro-examination



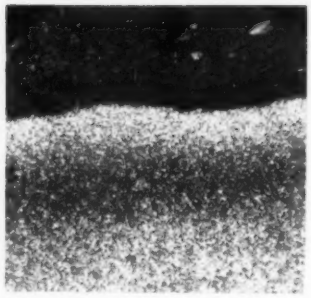
Differential draft gage helps show if air is entering a carburizing furnace to cause surface imperfections on parts being heat-treated



Decarburized edge proves that crack in tempered axle shaft started as a shear crack in forging, and did not develop in the quenching operation as might be expected



Local overheating during grinding caused soft structure and premature wear of roller ends



Increased carbon content of some clutch plates, making them difficult to grind, was traced to the types of furnaces used

filed down several thousandths of an inch, whereas the sides were file resistant. A condition like this could have been brought about by: (1) decarburization, (2) overheating in grinding, and (3) incorrect microstructure. Microexamination revealed the roller ends had a tempered martensitic structure several thousandths of an inch deep. Obviously the roll ends had been locally over-heated in grinding.

Problem H

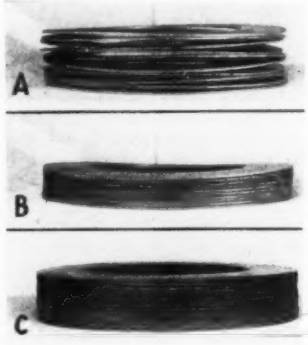
Specified heat-treating procedure called for selective cyanide hardening of only one end of a small-diameter clutch shaft, where wear resistance was desired. Because of certain service conditions, increased torsional strength was needed throughout the entire length of the shaft. This called for hardening the shaft completely. Warpage thereupon became so excessive that many of the shafts could not be inserted properly in their mountings whereas others, even though assembled, would not turn freely when assembled. The situation would not tolerate grinding for final size.

Circumstances — Regular procedure called for making the clutch shafts from SAE 1020 steel. One end for a short distance was desired to be file resistant. This end was immersed for a sufficient time in a sodium-cyanide, activated-type salt bath at 1550 F to produce a case depth of 0.006 in. The heated end was then quenched in water. When it became necessary to harden the shafts throughout their entire length, they curved or warped excessively when water quenched. Oil quenching reduced warpage but produced neither the desired degree of surface hardness nor torsional strength.

Solution—Since oil quenching helped to solve the distortion problem a medium-priced alloy steel was needed to obtain better surface hardness and higher torsional properties. The steel that fulfilled requirements and was virtually distortion free was the familiar SAE 8620 alloy steel.

Problem I

Operators complained of excessive wheel breakdown and low rate of stock removal when surface grinding certain lots of AISI 8645 high-speed clutching plates, oil hardened and tempered to Rockwell C 50-56.



Distortion of washers was traced to cold-rolling strains. **At top**—random stacking of hardened and distorted washers. **Center**—Stacked in relation to cold-rolling marks and distortion curvature. **Bottom**—Random stacking of washers given 900 F process anneal after stamping but before hardening

Circumstances—One would assume that work-pieces having the same hardness and made from the same steel would respond the same to grinding. Nevertheless, the operators claimed there was a difference between lots.

Solution—Hardness testing with both the Rockwell C and A scales showed that hard-to-grind samples were within the prescribed hardness range. Under the microscope, clutch plates that were difficult to grind revealed a carbon content increase to about 0.95% to a depth of several thousandths. This circumstance suggested that the trouble could be traced to the hardening furnaces.

Heat-treat facilities utilized were: an electric roller-hearth hardening furnace of the non-atmosphere type; a controlled-atmosphere, radiant-tube hardening furnace with a carburizing atmosphere potential of approximately 1.00% carbon, and an activated-cyanide, salt-bath hardening furnace. The only two furnaces capable of adding carbon to the surface were the controlled-atmosphere type and the salt-bath type. Since addition of carbon to such a shallow depth was not in any way necessary, the problem could be solved easily by either hardening most of work-pieces in the non-atmosphere-type electric furnace or by not making any natural gas addition to the endothermic-type atmosphere gas used in the radiant-tube furnace. The activated-type salt bath could not be changed readily, because it was needed for other kinds of parts. Hence, the salt bath was little used thereafter for hardening these plates.

Problem J

From time to time, certain lots of thin washers made from SAE 1010 cold-rolled steel distorted excessively when oil quenched from an activated-cyanide hardening salt bath. When this trouble was encountered, straightening costs increased rapidly and rejections occurred.

Circumstances — Washers are stamped from cold-rolled sheets,

which receive a pinch pass for better stamping properties. They are purchased with a bright finish to a maximum permissible out-of-flat tolerance of 0.015 in. A quick test to determine relative flatness after hardening is to stack them in piles. Obviously, close packing indicates a high degree of flatness.

Solution — Nothing regarding heat-treating practice could be singled out as causing the trouble. By stacking distorted washers it was hoped to associate the direction of the cold-rolling markings with the distortion pattern. This procedure helped somewhat in obtaining a more compact stack. Only when the cold-rolling markings and the curvature of the distortion were aligned by turning some of the washers over and over so that they fitted closer together was it possible to obtain the closest packing. From this it was deduced that strains from the cold working process must evidently be associated with the distortion problem.

To prove this contention, it was merely necessary to process anneal some washers taken from a lot that had given distortion trouble and then harden them in the regular manner. The group that had received the process anneal remained very flat during the hardening operation, thus pointing out the need for removing the cold-working strains prior to hardening.

Organization for Salvage Operations

It is doubtful that there exists a metalworking plant, which does not experience salvage problems from time to time. Each plant has its own method of conducting salvage operations. In many cases a salvage committee is formed from representatives of various departments, such as quality control, inspection, engineering, manufacturing and metallurgical. This committee may meet at regular intervals or may be convened when salvageable material accumulates.

Products that include heat-treating operations, such as carburizing, hardening and tempering, are usually ground or machined to final size. If any mistakes were made in the heat-treating operations or if the parts did not respond to heat treatment, any salvage operation involving heat-treatment is almost impossible because of distortion. This is true especially of parts held to close tolerances, some of which are under 0.001 in. Therefore, it is wise to keep all heat-treat operations under the best control.

APPLICATION OF PREVENTIVE MEASURES

SEVERAL principles should be followed to set up an effective preventive system to curb the incidence of shop problems:

1. Maintain all-heat treating facilities in a state of cleanliness and good working order.

2. Set up good control of incoming materials and process procedures by making necessary tests.

3. Keep all records, instruction sheets and specifications up to date.

4. Simplify all procedures and instructions as much as possible, aiming for conciseness yet not sacrificing thoroughness, and above all use simple language, with illustrations if necessary.

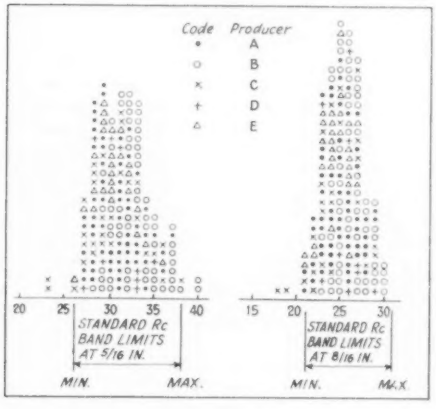
5. Make thorough records of each solution so that a recurrence of the problem can be speedily overcome.

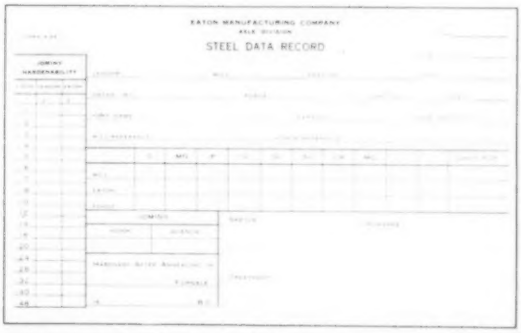
6. Make major changes in procedures, processes and materials only after thorough investigation and trial runs.

In regard to materials control, end-quench hardenability testing of incoming steels is one of the most popular items for discussion these days. One of its many purposes is as follows:

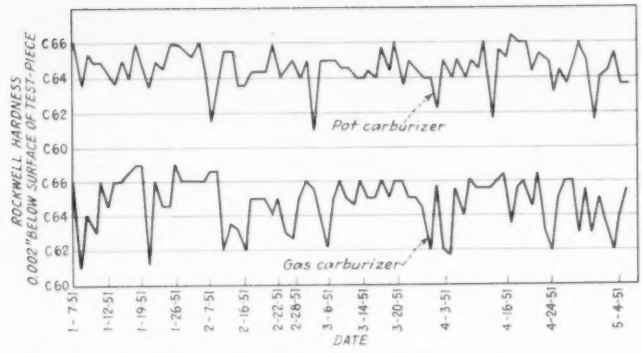
By plotting the values of the end-quench hardenability for each type of steel used, it is possible to chart the performance of any given steel mill. A statistical plot will show whether the mill produces heats of steel somewhat alike for hardenability or whether considerable variation exists between heats.

More often than not in heat treating, the history of a heat of

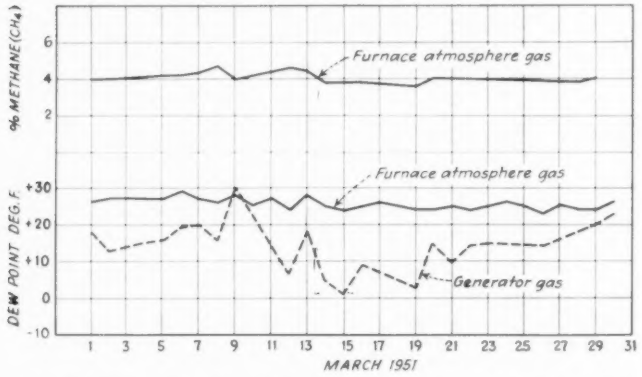




◄ **Statistical plot** of end-quench hardenability values for as-received steel, in this case AISI 8720H, shows the relative performance of suppliers in staying within band limits from heat to heat of steel



Uncontrolled case hardness is avoided by periodic Rockwell inspection of test-pieces. In this case the AISI 4615 pieces are 0.5 in. diam by 3.5 in. long, direct quenched from furnace



By continuous recording of the dewpoint of gas generator and furnace, respectively, and methane content of furnace atmosphere, the shop can tell if equipment is trending to drift beyond desired operating characteristics

GAS ANALYSIS REPORT

FLOW

AIR		
NATURAL GAS	74 C F H	
N_2 GAS	930 C F H	
AMMONIA		
OTHER		
SAMPLING DATE	4-9-51	
SAMPLING TIME	1:20 p.m.	
CARBON DIOXIDE (CO_2)	0.0	0.0
OXYGEN (O_2)	0.0	0.0
CARBON MONOXIDE (CO)	19.4%	20.8%
METHANE (CH_4)	4.8%	0.4%
HYDROGEN (H_2)	40.2%	42.0%
DEW POINT (X ALNOR RECORDER) °F.	+24 F.	+9 F.

PROCESS UNIT: Furnace #25 Gas Carb. | Generator #4 2-tube RX

Report to

Copy to

Laboratory File: Furnace #25 Gas Analysis

COMMENTS: Parts are file hard and case depth is within production standard limits.

Carrier gas generator is working satisfactorily.

Date of Report: 4-9-51 Signed: M. R. Koehn

A gas-analysis report card helps the supervisor to tell how well a particular gas generator is working and how it is affecting the furnace served

steel is needed to be sure of processing it properly for desired mechanical properties and service performance. Most plants have some kind of form record that shows the necessary details. But if in addition a code system is worked out for stamping or marking the parts, it is later possible to trace the origin of any material used. Thus, if problems arise in the shop or in service, the solution is materially aided by being able to identify the material's source.

Processing procedures can be kept running smoothly by instituting a routine control test program. As applied to heat treating furnaces, a random part may be sampled at any desired time interval for metallurgical examination.

Equipment-performance records are necessary if one expects to spot process deviations and sources of trouble. In carburizing, for example, make a continuous graph of control test-pieces, to uncover any trend away from desired limits. The daily methane content of the gas atmosphere within a carburizing furnace can be charted over a month. Respective dewpoints of the furnace atmosphere and the generated carrier gas can be added. Notes are made on the graph if an unusual circumstance occurs.

Accumulated records are invaluable for solving shop problems. Not only do they serve an immediate purpose but make available at any moment past performance of any production facility on which such records have been kept. In brief, they are a virtual log book.

Instruction Sheets

Explicit written instructions covering the operation of any production facility should be made available to the operating personnel and supervisor in charge. Then, the moment trouble develops it is possible to check on many places where it might have started. For instance, with a listing of the pressures of various furnace appurtenances it is possible to check readings against values on the instruction sheets.

Such instructions are developed over a period of time and are augmented by revisions as more and more is learned.

OPERATING INSTRUCTIONS

SURFACE COMBUSTION CONTROLLED ATMOSPHERE CYCLE ANNEALING FURNACE

FURNACE NO. 24

PROCEDURE

1..Three loaded trays shall be pushed into furnace every hour. The total time in the furnace is 14 hr. The weight of the work shall be 400 lb per tray, which amounts to 1200 lb per push, or a gross weight of 1788 lb, including trays and sideboards.

2..The operator shall watch each load of work for evidence of undesirable scale formation or any variation for the usual appearance of the work. Any change noted shall be reported to the foreman.

3..A polished test piece shall be prepared by the operator of the first shift and shall be put in the furnace by the operator of the second shift about 6 pm. Operator of first shift will then get test piece next morning and turn it over to his foreman. Laboratory shall be notified as soon as possible if test piece does not have a normal appearance.

4..The two pilot lights in the manifolds should burn with a blue flame 3 to 4 in. high without any yellowish tinge. If this condition cannot be obtained, the inspirator should be cleaned by the pipe fitter.

5..Flame must be present below the outer charge and discharge doors at all times when there is MDX protective gas in the furnace and when either door is opened the flame must form a curtain over the opening high enough to prevent the entrance of air.

6..Special operations are required when starting the first loaded trays through the furnace. After the hot work enters No. 3 zone and will maintain the temperature of this zone, turn switch for No. 3 zone (in rear of panel board) to "OFF" position and regular dampers in air cooling tubes as follows:

AIR COOLING TUBES

Soaking zone	**←1**	**2**	**3**	**4**	**5**	**6**	**→Cooling**
Damper position	closed	1	2	open	open	open	

Then start cooling air blower and close gas cocks at all radiant tube burners in No. 3 zone.

7..After completing operations in item 6 above, close gas cocks at all radiant burners in zone No. 4 and set No. 4 pyrometer control instrument at 1400 F.

GAGE READINGS

MDX gas flow gage,normal operation.....7.5 in.
Air to MDX gas generator, maximum.....20.0 oz
For purging furnace chamber, set air pressure at 20.0 oz. and gas flow should be over 8.0 in.

NOTE:

Vary the air pressure to hold 7.5 in. gas flow but do not exceed 20.0 oz. air pressure. If the gas flow cannot be maintained at 7.5 in. with the air at 20 oz. the gas line is probably plugged with dirt at the bottom of the water-cooling tower or the air-gas inspirator needs cleaning.

Gas-air ratio-dial setting 7.00
(Lower the ratio setting to increase amount of CO_2.)
Water pressure on top of MDX gas cooler.....10 lb
Hydraulic pump; charge end; when operating..600 lb
Air pressure, Spencer-Turbo-Compressor.....22-24 oz
Incoming gas pressure.....28-34 lb
Gas pressure to burners (gage near roof beam)..10 oz
Gas pressure on 4 gages (low down on west side) .....8-10 oz
Air pressure on 4 gages (high up on west side) .....19-23 oz

PYROMETER CONTROLS	SETTING	DESIRED OPERATING RANGE
No. 1 zone; charge;	1640 F.	1580-1660 F.
No. 2 zone; soak;	1700	1680-1720
No. 3 zone; cooling;	1240	1200-1260
No. 4 zone; holding;	1400	1060-1140
No. 5 zone; holding;	Off	960-1000
No. 6 zone; cooling;	Off	680-720

If these temperature ranges cannot be maintained, the operator must notify his foreman who in turn should notify the labcratory.

HOURLY CHECKS BY OPERATOR

1..Temperatures as shown by recorders.
2..Pilot lights at all radiant tubes.
3..MDX gas flow and air pressure at gas generator.
4..Gas curtain at both outside doors.

DAILY CHECKS & MAINTENANCE BY OPERATOR ON FIRST SHIFT

1..Check zero liquid level in MDX gas flow gage and report to foreman if not correct.

2..Report to foreman if incoming natural gas pressures vary from normal settings.

3..Look all seals over carefully and report any leaks to the foreman.

4..If necessary, lubricate pushrods on charge end and pullrods on discharge end with graphite grease.

5..Check level of oil in hydraulic reservoir and add Sohio DE 52 turbine oil to maintain proper level if oil level is low.

6..Check flow of cooling water at three cooling units and adjust flow if necessary. Water should be warm to the hand.

7..Look for carbon build-up in radiant tubes and if any is noted report to foreman who should have tubes blown out.

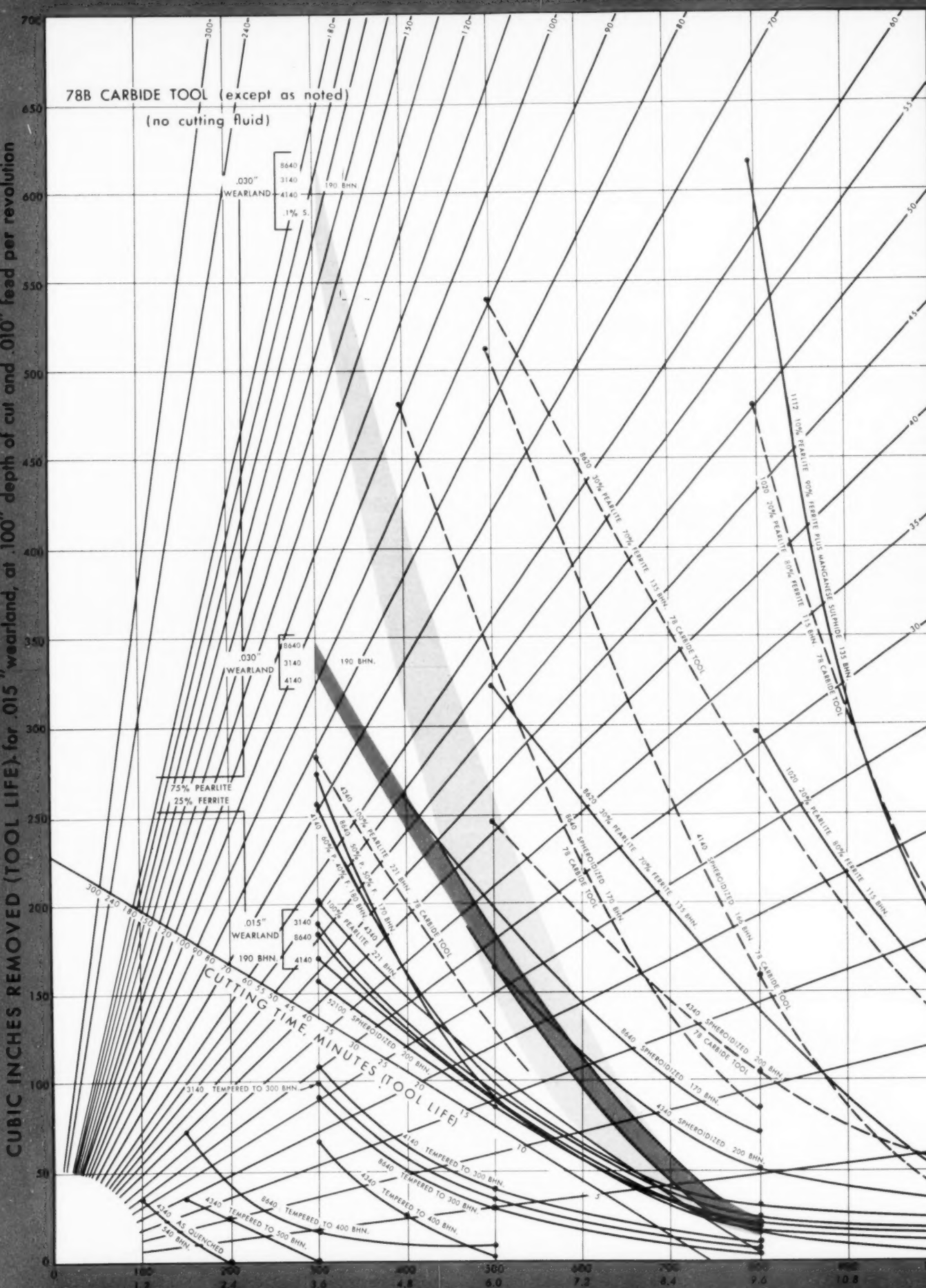
WEEKLY CHECKS BY FIRST SHIFT OPERATOR EVERY MONDAY

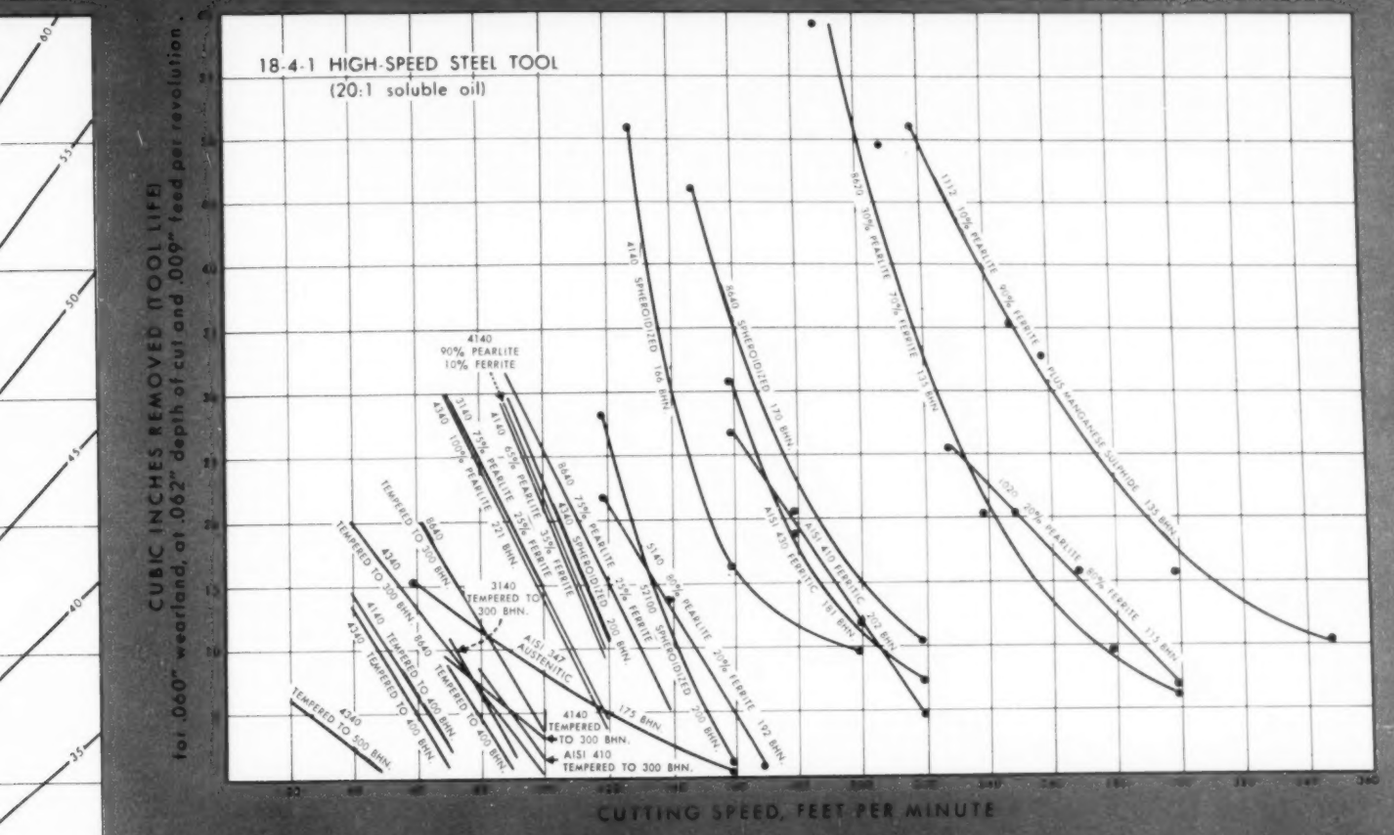
1..Check air filter on combustion air blower. If filter is dirty, report to foreman, who should have maintenance department clean the filter.

2..Have thermocouples and their location in furnace checked by proper person. The outer end of the thermocouple should be 16 in. from the furnace shell for zones No. 1, 2 & 3, and 20 in. for zones 4 & 5.

OCCASIONAL CLEANING

When furnace is shut down (but not oftener than once a month), have pipe fitter clean MDX gas line at bottom of cooling tower and air-gas inspirator to the gas-generating unit. Once each year (about Nov. 1), the cooling tower for the MDX gas shall be dismantled and cleaned along with the spray nozzle and the Rauchig rings.


78B CARBIDE TOOL (except as noted)
(no cutting fluid)
CUBIC INCHES REMOVED (TOOL LIFE) for .015 "wearland, at .100" depth of cut and .010" feed per revolution
CUTTING TIME, MINUTES (TOOL LIFE)
CUTTING SPEED,
PRODUCTION RATE, CU
.030" WEARLAND
.015" WEARLAND
8640
3140
4140
.1% S.
190 BHN.
75% PEARLITE
25% FERRITE
100% PEARLITE 221 BHN. 78 CARBIDE TOOL
8620 30% PEARLITE 70% FERRITE 135 BHN. 78 CARBIDE TOOL
1020 20% PEARLITE 80% FERRITE 115 BHN. 78 CARBIDE TOOL
1112 10% PEARLITE 90% FERRITE PLUS MANGANESE SULPHIDE 135 BHN. 78 CARBIDE TOOL
4140 SPHEROIDIZED 149 BHN. 78 CARBIDE TOOL
4340 SPHEROIDIZED 200 BHN. 78 CARBIDE TOOL
8640 SPHEROIDIZED 175 BHN. 78 CARBIDE TOOL
52100 SPHEROIDIZED 200 BHN.
3140 TEMPERED TO 300 BHN.
4140 TEMPERED TO 300 BHN.
4340 TEMPERED TO 400 BHN.
8640 TEMPERED TO 400 BHN.
4340 TEMPERED TO 500 BHN.
4140 AS QUENCHED 540 BHN.


18-4-1 HIGH-SPEED STEEL TOOL
(20:1 soluble oil)
CUBIC INCHES REMOVED (TOOL LIFE)
for .060" wearland, at .062" depth of cut and .009" feed per revolution
CUTTING SPEED, FEET PER MINUTE
4140
90% PEARLITE
10% FERRITE
4140 SPHEROIDIZED 190 BHN.
8640 SPHEROIDIZED 175 BHN.
8620 100% PEARLITE 75% FERRITE 137 BHN.
1112 100% PEARLITE 90% FERRITE
BLUE MANGANESE SULPHIDE 135 BHN.
100% 20% PEARLITE 80% FERRITE 115 BHN.
AISI 410 FERRITIC 181 BHN.
AISI 410 FERRITIC 202 BHN.
5140 20% PEARLITE 20% FERRITE 192 BHN.
52100 SPHEROIDIZED 200 BHN.
4140 TEMPERED TO 300 BHN.
AISI 410 TEMPERED TO 300 BHN.
175 BHN.
3140 TEMPERED TO 300 BHN.
AISI 347 AUSTENITIC
8640 TEMPERED TO 300 BHN.
4340 TEMPERED TO 300 BHN.
4140 TEMPERED TO 400 BHN.
8640 TEMPERED TO 400 BHN.
4340 TEMPERED TO 400 BHN.
4340 TEMPERED TO 500 BHN.
3140 75% PEARLITE 25% FERRITE 221 BHN.
4140 65% PEARLITE 35% FERRITE
8640 75% PEARLITE 25% FERRITE
8640 SPHEROIDIZED 220 BHN.
4340 100% PEARLITE

TOOL LIFE vs CUTTING SPEED

TWELVE STEELS, TYPICAL MICROSTRUCTURES

This chart summarizes data in the United States Air Force Machinability Report, 1951. Tool-life curves for similar structures of twelve steels are shown. The fact that these curves turn out to be grouped into bands shows that like structures have similar machining characteristics. It indicates that whatever the steel in question, any given structure will machine like the same structure of other steels. Thus, this chart may be used to estimate tool-life cutting-speed data for any steel simply by finding the corresponding structure and then taking into account any difference in wearland and depth of cut. (Refer to text on the back of this insert and the alignment chart in Reference Book Sheet of this number for explanation of these factors.) Dash-line curves are for 78 finishing-grade carbide; solid lines for 78B general-purpose carbide.

SPEED, FEET PER MINUTE
E, CUBIC INCHES PER MINUTE

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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330 WEST 42nd ST., NEW YORK 18, NEW YORK

EFFECT OF BORON STEELS ON SHOP PROBLEMS

THE new boron steels, which industry must now use, are likely to introduce shop problems for awhile. This is usually the situation when steels are reduced severely in alloy content. Greater control will be required in the various heat-treating operations.

As the writer sees it, the immediate problem is not so much one of how to handle the new steels but to choose the right ones for replacement. The trend so far has been to use a lower carbon range in the lean-alloy carburizing grades in comparison with the regular richer alloy grades. For example, the pre-emergency carburizing grades for many applications averaged approximately 0.20% carbon. Equivalent boron-treated, lean-alloy steels average approximately 0.15% carbon if the permissible alloy content is high, such as 1.75% nickel and 0.20% molybdenum. For the lean-alloy boron steels it will average around 0.17% for parts of medium section. Carbon over 0.20% in the boron-treated alloy steels introduces too much distortion in parts intended for gears.

Case hardenability will be a problem for some, if their sections are heavy and they are forced to use the very lean alloy boron types. Lower hardenability of the case will be reflected in spottiness or irregular case hardness. To overcome this, more drastic quenching will be needed, and this necessity will in all probability entail revisions in the quenching set-up and equipment. The lean-alloy boron-treated steels are also reported as causing more distortion than the pre-emergency steels they replaced. This makes it bad where no grinding stock is provided, such as in the gear making industry.

There is a good possibility that the boron steels will alleviate to some extent, shop problems involving machining. These new steels appear to machine somewhat better than the standard steels they are replacing.

It is doubtful if many shop problems will come about as a result of using the medium-carbon boron alloy steels. The main problem will be to choose the right grade. If this is done correctly, there is no reason why there should be any more of a shop problem with the new steels than with the old. Again more drastic cooling may be necessary where large sections are being heat treated, because the boron-treated steels drop off in hardenability faster than the regular steels at points farther out towards the end of the end-quench hardenability curve. Boron-treated steels require lower tempering temperatures to develop a specific hardness in comparison with the higher alloy steels they replace. This may pose a shop problem for some individuals in that they will have to learn anew what tempering temperatures to use to make the product come within the specified hardness range for the product.

The author wishes to express his appreciation to all contributors of illustrations for this report, and to the staff of the Axle Division laboratory, particularly D. C. Wickson, who prepared the majority of the photo-micrographs.

Tips FOR TOP SHOP MEN

403 Be sure every job, or at least every *class* or *type* of job, is assigned to somebody or some group. When *everybody* is responsible, actually *nobody* is.

404 Keep assignments clean and clear; avoid overlaps.

405 If you must check everything your subordinates do, something is wrong. You'll be so busy handling routine that you'll have no time for the exceptional things you should be ready for.

406 Never forget the virtues of publicity. Tell people that count what you and your organization are doing—but don't exaggerate. Smart publicity is informative, not just bragging.

THAT KID'S GOT SPUNK!
YEAH! ALSO A DAD WHO OWNS TH' SHOP
I FEAR YOU DID NOT FOLLOW TH' LAYOUT SIR AND-YOUR TIME EXCEEDED TH' ESTIMATE 45%- IF YOU CARE TO STAY AFTER WORKING HOURS I'LL TEACH YOU TO OPERATE THIS NEW MACHINE
"HOW TIMES CHANGE"

U. S. Air Force Machinability Report 1951

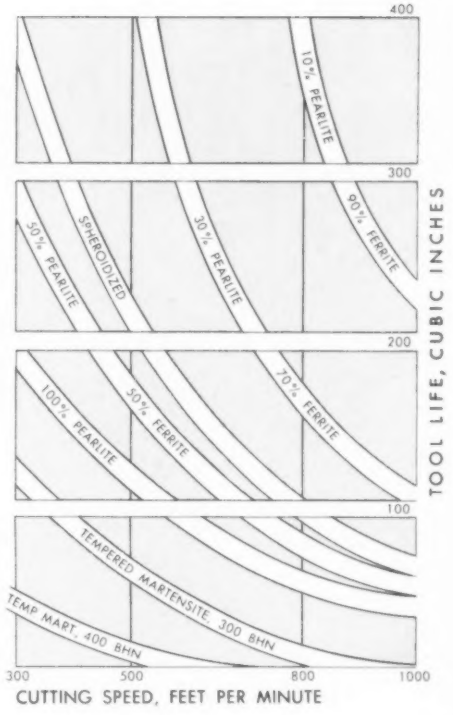
The Air Materiel Command of the United States Air Force recognizes the need for machinability research, as a vital part of mobilization. The first report (*AM*—Nov. 27, 1950, p109) was issued in book form by the Curtiss-Wright Corp., Wood-Ridge, N.J., since the entire machinability program was carried out under the guidance of R. T. Hurley, president of that company.

The second book, now available from Curtiss-Wright, takes up where the first one ended, and is devoted primarily to the machining of a wide variety of commonly used steels. However, some material is included on machining titanium (see the Reference Book Sheet in this number). Significant data, not published here, are also given on the effect of machining upon the endurance limit of metals.

Microstructure Determines Tool Life

Tool life varies with microstructure. The chart shows seven microstructures typical of the steels tested and the general order of tool life that can be expected at given cutting speeds. As indicated by the schematic curves, tremendous improvement in tool life may be effected by heat treatment before machining.

For a discussion of microstructures, refer to the Reference Book Sheets, "Microstructures of Metals," (*AM*—Jan. 22, 1951, p315 and Feb. 5, p165).



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Tests Conditions

Tests were carried out with 78B general-purpose carbide and 78 finishing carbide, also with 18-4-1 HSS. Normally, carbides cut well until a 0.030 in wearland is reached. Tests were usually stopped at 0.015 in. wearland to conserve time. Tool life shown on the curves (see inside of insert) can be multiplied by 2 to get cubic inches at 0.030 in. wearland at selected cutting speed. HSS tests were ended at 0.060 in wearland.

A depth of cut of 0.100 in. was used for carbide tests, because it is representative of production conditions and is at the same time the smallest depth for a roughing cut. HSS tests were run at 0.062 in. depth of cut. Feed per revolution for carbides was 0.010 in.; for HSS it was 0.009 in.

Tool Angles

CARBIDE

Back rake 0°, side rake 6°; side cutting edge angle 0°; end cutting edge angle, 6°, relief 6°, nose radius 0.040 in.

HSS TOOLS

Back rake 0°, side rake 15°, side cutting edge angle 0°, end cutting edge angle 5°, relief 6°, nose radius, 0.040 in.

Cutting Speeds

Tests were planned to cover a range of speeds from a slow enough speed to produce about one hour's cutting up to high enough speed to cause virtually instantaneous tool failure. For carbides the low speed limit was usually 300 fpm, and the high speed limit was sometimes as high as 1500 fpm. With HSS it was necessary to use speeds from 20 to 360 fpm. Carbides were run dry; HSS tests were made with 20:1 soluble oil.

Tool Life Curves

Interpret the tool life curves as bands, instead of precise lines. Refer also to the production rate chart for 8640 (Reference Book Sheet in this number). This chart may be accepted as typical of the 0.40% carbon steels which are broadly used in industry.

Interpretation of Tests

AISI B1112

This acid Bessemer steel is used where good machinability is of primary importance. Because of its low carbon content (about 10%) this steel cannot be hardened. Microstructure consists of about 10% pearlite and 90% free ferrite. Its excellent machining properties permit a tool life of 630 cu. in. for a wearland of 0.015 in. when cutting at 800 fpm with a 78B carbide tool. Most other steels show a volume removal of only 30 cu. in. at this speed, before the tool chips or is seriously damaged.

AISI C1020

Machinability of 1020 is lower than 1112, because of higher pearlite content—about 20% for stock tested—and no manganese-sulphide inclusions from sulfur additions. Tool life with general-purpose carbide 78B is approximately half that for 1112 at 800 fpm, but with finishing-grade 78 tool life approaches that for screw stock.

Using 78B, optimum feed is 0.010 ipr at 800 fpm; 0.020 ipr at 500 fpm.

AISI 8620

Annealed 8620 has a structure similar to 1020, but alloying elements permit from 20 to 40% pearlite to form. Samples tested: 30% pearlite.

8620 is a low-cost carburizing steel, develops good core strength. By contrast, 1020 cannot attain appreciable core strength in heavier sections. Successful machining in hot-rolled condition requires close control of cooling. Uniform, coarse structure is basic for good machinability. Hence, cycle annealing is favored.

Tool life of 8620 is about half that of 1020, one-fourth that of 1112, but three times better than annealed 0.40% carbon steels. Therefore, it is much used when machining is extensive, unless higher carbon steel is needed for strength.

With high-speed steel tools, 8620 machines practically as well as 1020.

AISI 3140

This and the following 0.40% carbon steels develop full hardness at the surface and a satisfactory hardness gradient to the softer but tough core. All such steels machine about the same, provided they are annealed to produce the same microstructure. Note: The same specific annealing treatment would produce widely different structures in the various steels.

3140 steels were tested in three states. Fully annealed (75% pearlite-25% ferrite) gives twice the tool life of quenched and tempered 3140 (300 Bhn)—a commonly used hardened condition. This points to

feasibility of considering economic justification for an annealing operation before machining.

Tool life of annealed 3140 at 500 fpm is about one-half that of 8620.

Resulfurization of alloy steels is being studied by many concerns as an aid to machinability. Annealed steel with 0.10% S affords about 50% higher tool life as compared to plain 3140, and the gain is higher for HSS tools. When resulfurized 3140 is tempered to 300 Bhn, the martensitic structure can be cut with carbide at higher speeds than plain steel (at speeds up to 500 fpm). Marked improvement is shown with HSS tools.

AISI 4140

In production, this steel (like most 0.40% carbon steels) is forged to shape. Important consideration in machining is suitable microstructure. Usually desired is a coarse lammeller pearlitic structure with free ferrite of uniform grain size and distribution at minimum heat treating cost. Sometimes normalizing is necessary but great savings can be gained by low-cost annealing, especially cycle annealing that utilizes forging heat.

Tests were made with 78 and 78B carbide on annealed 3140 – 65% pearlite, 35% ferrite, on a spheroidized structure and on tempered martensite of 300 and 400 Bhn. The spheroidized structure gave by far the best tool life, but the added cost of this heat treatment process over cycle annealing is seldom justified, unless a greater than average amount of machining is required. 78 carbide about doubles the performance of 78B, when there are no shock loads or excessive scale to chip the brittle 78 carbide.

Surface finish produced with spheroidized structure is little different than with the pearlitic structure, when carbides are used. But poorer finish is secured with HSS tools. Hence, this structure is undesirable on operations like gear cutting and form-tool work.

Behavior of 4140, quenched and tempered to 300 Bhn, is closely parallel to results with 3140 and 8640 in the martensitic condition, when 78B carbide is used. This is further proof that, for a given structure, the cutting performance will be similar, especially with carbide tooling.

Resulfurization of 3140 improves the tool life about 60% with 78B and more than doubles it for HSS over the practical cutting range of 80 to 120 fpm. Refer to curves for resulfurized 3140 with 90% pearlite, 10% ferrite.

Machinability of resulfurized, tempered 3140 is improved in the lower speed ranges for the carbide tools and is considerably better for high-speed HSS tools.

AISI E4340

Deep-hardening 4340 is usually forged to shape, heat-treated to improve machinability, rough machined and heat-treated again to the desired strength and hardness before finish machining or grinding. Six structures were tested. For carbide tooling, the tool life in turning all of the 4340 structures was as good or better than other 0.40% steels, except spheroidized.

Annealed 4340 (100% pearlite) gives a tool life of 125 cu. in. at 500 fpm, whereas 4140 annealed to 90% pearlite-10% ferrite gives only 100 cu. in., using 78B tools.

In the martensitic state, tempered to 400 Bhn, the 4340 produced a tool life of 55 cu. in. at 400 fpm, whereas 4140 allowed only 45 cu. in. Moreover, the tool life of 4340 at 400 fpm, and using 78 carbide, is superior to that obtainable with 78B on 4140, 3140 and 8640 of 300 Bhn. On the other hand, HSS tools gave poorer tool life on 400 Bhn material than the other steels in the 0.40% carbon group.

In some products, the metal must be hardened as much as possible. When 4340 was tempered to 500 Bhn, drastic reduction in cutting speed was required to obtain reasonable tool life. With 78 carbide, the tool life at 150 fpm was 170 cu. in., or 90 min. cutting time at a stock removal rate of 1.8 cu. in. per min. Above this speed, the tool life fell off sharply. Tool life is poor with HSS tools.

AISI 5140

This through-hardening chromium steel is approximately interchangeable with 3140, 4140 and others when deep hardness is not required. Primary reasons for its selection over equivalent steels would be price, availability and simplification of inventories. 5140 anneals readily and is a good choice for parts requiring extensive machining but only moderate strength. Hardenability is poor.

Annealing of 5140 in general follows the recommendations for other 0.40% carbon

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steels. Its transformation time is short for formation of pearlite, thus making the material ideal for salt-bath annealing.

When annealed to a structure consisting of 80% pearlite-20% ferrite, 5140 appears to machine with somewhat better tool life than the 75% pearlite-25% ferrite structures in the other 0.40% carbon steels. This is true with carbides and HSS. No tests were made on the steel in the quenched and tempered state.

AISI 8640

This nickel-chrome-moly steel is widely used throughout industry. In production, the steel is forged to shape, rough machined, quenched and tempered to desired physical properties, and then finish machined or ground.

Microstructure of the forgings is of prime importance to machinability. When 8640 is random cooled from forging temperatures, the material will be pearlitic with varying amounts of ferrite and Widmanstatten structure. Grain size and distribution of constituents will be non-uniform. Therefore, it is desirable to investigate normalizing, furnace cooling, and cycle annealing, as means to obtain consistently uniform structures. Also determine whether the added cost of spheroidizing is justified.

Machinability tests on 8640 proved once more that hardness is less reliable than microstructure in predicting tool life. Six structures were tested, the steels not being resulfurized.

The spheroidized structure gave the best machinability. However, two structures were obtained by annealing. The 50% pearlite-50% ferrite structure had a hardness of 170 Bhn, but gave much less tool life than spheroidized steel at 180 Bhn. On the other hand, the greater amount of free ferrite in this annealed steel made it much easier to machine than a 75% pearlite-25% ferrite structure, which incidentally had a hardness of 190 Bhn. The slight difference in structure hardness was of lesser importance than the reduction in free ferrite content in the second annealed steel.

If random-cooled, forgings exhibit a Widmanstatten structure, annealing might be dispensed with, because this structure does not materially reduce machinability.

Resulfurization of 8640 did not produce results consistent with those on the other 0.40% carbon steels. On annealed steel (65% pearlite, 35% ferrite), tool life at 300 fpm is practically doubled, using carbide tools. With HSS, the tool-life gain is even greater and the cutting speed is increased. On martensitic structure, 300 Bhn, the resulfurized steel actually gave poorer results than the plain steel, when carbide tools were used, but improved tool life for HSS.

AISI E52100

This high-carbon, through-hardening, anti-friction bearing steel is almost always sold to the consumer in the spheroidized condition unless otherwise specified. Steel with 0.80% carbon or over, when normalized or annealed at ordinary cooling rates, produces a microstructure containing pearlite plus excess cementite (carbides) at the grain boundaries. These carbides make for difficult machining, because of their high hardness. That is why the steel is put into the spheroidized condition. Nature of the material is such that most consumers prefer the mill to do it.

Stainless Steels

AISI 430

This steel is typical of the magnetic, nonhardenable stainless steels. The structure is basically ferritic. It provides about the same tool life as 1020. This shows the importance of knowing which stainless steel is involved when someone says that "stainless is hard to machine."

AISI 410

This steel behaves somewhat like low-alloy, medium-carbon steels. It is magnetic, can be annealed to ferritic structures and hardened and tempered by heat treatment. With 78 carbide, annealed 410 machines much like 8620 (30% pearlite-70% ferrite) does with 78B carbide. With HSS, tool life is about equal to 430, but less than 8620.

410 with martensitic structure (300 Bhn) machines about like the 0.40% carbon steels of the same hardness.

AISI 347

An austenitic stainless steel, 347 workhardens rapidly and has the poorest machinability of the three types reported. Its machinability is lower than the 0.40%-carbon, 75% pearlitic structures.

Not, PLEASE, In the Name of Fairness

Our national Office of Economic Stabilization has adopted a policy of gearing wages to the cost of living. We are told that "escalator clauses," which provide that rates of pay shall be adjusted to take account of changes in the cost of living, will be generally approved.

If the adoption of this policy had been announced as a frank concession to political expediency, it would have been quite understandable. There may very well be votes, lots of them, in a policy which purports to protect the income of a large group against loss through the price inflation caused by the defense program.

A case might even have been made for a policy of approving escalator clauses on grounds of production expediency. The leaders of some three million organized workers now covered by such clauses have indicated that they would fight to the limit to keep them and thus maintain "real wages," that is, wages measured by their purchasing power. The leaders of other organized groups have indicated they would fight to get the benefit of such clauses. Denial of them might mean serious strikes.

Justified "in Fairness"

However, the policy of approving escalator clauses was not based on these relatively low grounds of expediency. It was justified on high moral grounds, on grounds of "fairness." In the words of the President's Council of Economic Advisers, "maintenance of real wages during inflation cannot in fairness be disallowed."

That proposition is false.

It would be truthful to say, "maintenance of real wages during inflation cannot in fairness be allowed."

The truth of the corrected proposition becomes evident immediately when you take a look at the basic nature of the inflationary problem created by defense mobilization.

We are devoting a large share of our national production to defense. The share is now scheduled to hit about 20% in 1952.

Since we are not able to increase our total production fast enough to meet defense needs

in addition to civilian needs, that means a cut in the supply of goods and services that is available for civilian consumption. But the money paid out for the production of defense materials is added to that which is available to buy civilian goods.

Thus, more money is put into the hands of the people to buy less goods. So prices go up. That is inflation.

If one group of people then is granted enough additional money to offset the price increases — and that is the purpose of an escalator clause — and thus can continue to buy as much as they have been buying right along, less goods will be left for other consumers who are not getting this advantage. That is palpably an unfair distribution of the sacrifices necessitated by defense mobilization. In fairness, therefore, maintenance of real wages in inflation cannot be allowed.

Organized workers were not the first, of course, to get the benefit of an automatic adjustment to take account of the increased cost of living. The farmers got theirs first. The price parity formula is, in essence, an escalator clause. The federal government underwrites increases in the prices of the things farmers sell in order to match increases in the prices of the things they buy.

Crucifying the Helpless

As matters stand, two groups are without benefit of escalator clauses. One group is composed of manufacturing firms. While they have not been nearly as successful as the misleading reports of "record-breaking profits" suggest, they have been able to look after themselves fairly well — thus far.

But one group is completely without protection. It is that numerically large but politically unorganized mass of people — many of them old and relatively helpless — who are trying to live on pensions, annuities and other fixed incomes derived from their savings. They are at the end of the line when the increased costs of inflation are passed along. They have no one to whom they can pass the buck. They are being progressively pauperized by the continuing inflation caused by progressive boosting of costs and hence prices.

With the present line-up of pressure groups in Washington, protection for the principal victims of inflation — those who have saved for a rainy day only to find inflation has blown away the roof — is obviously an extremely difficult business. But to have even temporary insulation against inflation granted to powerful groups in the name of fairness should be offensive to the nostrils of a nation that presumes to assert the moral leadership of the Western World.

The only really fair way to handle inflation is to prevent it. But once it is under way, fairness demands that the burdens be as evenly distributed as practicable.

An escalator clause — or a farm parity provision — is explicitly a device to enable the group favored by it to escape the burden of inflation. Whatever concessions we feel we must make to political pressures or production expediency, let us at least be honest enough not to invoke "fairness" as justification for so arbitrary a discrimination in the distribution of the defense burden.

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ROUND TABLE

Machines or Men?

"Ed, have you looked over our apprentice course lately? Looks to me like it needs modernizing."

"What's wrong with teaching boys the fundamentals of running machines? Have they changed too, Al, since we became a Democratic country? Seems to me a lathe is still a lathe."

"Maybe so, Ed, but there's a lot of stuff in that course that fits twenty years ago but doesn't fit today. For example, we've got a lot of material about changing belts—and we have only one or two belt drives in the place."

"Won't hurt the boys to learn about belts—it might give 'em an idea of how hard the trade was."

"Yes, Ed, it might. But there's nothing in the course about handling men, or getting along with others—and that's the foreman's biggest problem."

"Wait a minute, Al! We're talking about a machinist apprentice course—not a foreman training program."

"That's just what I'm getting at, Ed. How many of our apprentices actually stay long as machinists? Within a couple of years, they're assistant foremen, or methods men, or inspectors; they've actually left the trade they spent 4 yr to learn."

"But it's because they know the trade that they get better jobs. We hand-pick those kids to get the best men, then train 'em darn well. They know their jobs—that's why they get better ones."

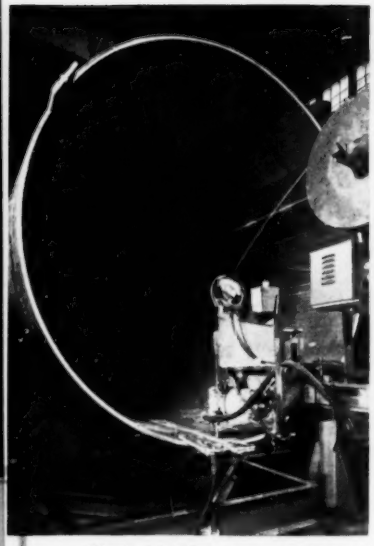
"Agreed, Ed. But I insist they know some parts too well. If we're really training men for higher jobs, they don't need to know so much about mending or shifting a belt—or running a lathe, for that matter. They ought to spend more time on management problems. They ought to learn how to handle men rather than machines."

"If they look like they're going some place, we can always give 'em later training on the stuff their new job will take. Let's let the apprentice course stick to apprentice training—give 'em a really down-to-earth background on shop tools and methods. Don't get the cart before the horse."

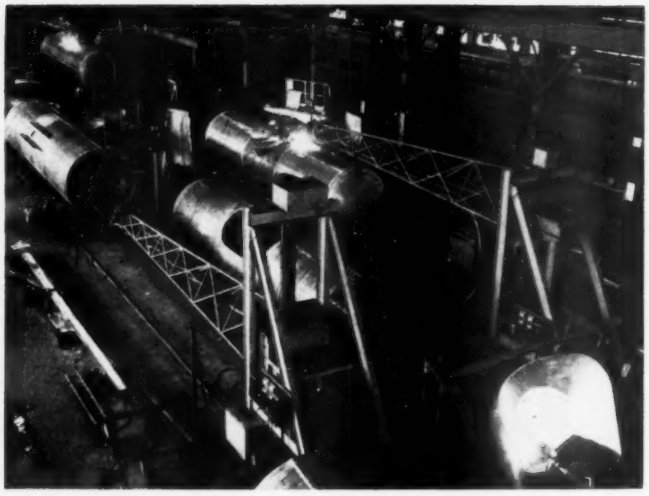
"I'm not, Ed. There are other angles to it. You obviously feel that if they don't get the mechanical know-how as apprentices, they'll never get it. I say the same thing goes for the human know-how. They've got to learn that early and here—or they'll pick it up on street corners from some cockeyed radical. That spells later trouble—a foreman or methods man ought to know management's side as well as he does labor's."

"Now, you're really getting off base, Al! Are we supposed to train kids in a lot of college bunk?"

STATISTICS SHOW *that a high percentage of apprentices "leave the trade" for better jobs within five years. Should their training allow for that—or should the training for management be a later, separate thing? Your ideas will interest others. Discussions on earlier topics appear on later pages.*



Start of inside seam weld. Material is 13/16 to 1¼ in. thick. Welding wire is ⅛ in., 43-S aluminum, and tanks are 61-ST6 aluminum. Welds are made in a single pass at 5½ to 6 ipm. After welding, run-off tabs are removed



Inside and outside longitudinal welds are made on three seams of 33-ft-long car tanks. Tack welds are made on outside seams at 16-in. intervals. Inside is welded first, then tacks and outside welding groove are chipped out before outside welds are made. Machine is stationary, and tank advances on jig mounted on special track

SEMI-AUTOMATIC WELDING

High-quality welds made at high speed

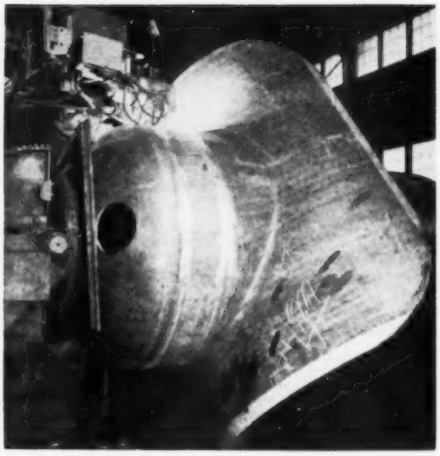
ALUMINUM TANK CARS are being fabricated at General American Transportation Corp., Sharon, Pa., on a production basis, largely by use of Sigma (Shielded Inert Gas Metal Arc) welding. The process is much faster than manual Heliarc welding, and there is a substantial saving in argon. Gas consumption averages only 40 cu ft per hr, as against 70 cu ft with Heliarc.

In the construction of the 10,000-gal. car tank, the manual Heliarc welding process was formerly employed for welds inside the closed tank, tack welding, and welding around corners, but the change-over to semi-automatic Sigma welding was made upon receipt of this equipment.

Tank cars necessarily receive rough handling in railroad service, and for this, as well as other reasons, it is imperative that welds be absolutely sound. They must be perfectly free of all defects, as AAR and ICC Codes demand that they be X-rayed and the resultant film show clear. They must also present a smooth interior to facilitate cleaning. These conditions are currently being met without difficulty.

Four boom-type welders are now in use; three are used interchangeably for the longitudinal inside and outside welds, welding the heads, welding the dome to the tank, and welding the tank anchors; the other is employed in welding the inside and outside seams of the saddle, dome shell and dome head.

One head is fitted, tack welded outside, then machine welded inside. Tacks and welding groove are chipped out, and outside seam is made. Hole is then cut at center of tank to permit man to enter to hand weld inside seam of second head with Heliarc torch. Outside seam is machine welded, as on the first head



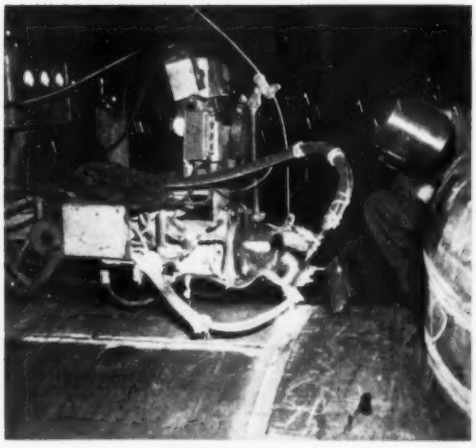
Saddle and dome sections are tack welded outside with Heliarc torch, machine welded inside, tacks and welding groove chipped out, and machine welded outside. Dome is of 25/32-in. plate, and saddle is made from 1¼-in. plate. Dome fittings are installed and hand welded later, as are the 22 insulation brackets on the body of the tank

Saddle is tack welded in place over large opening cut out with oxy-arc torch. Opening is made by enlarging the manhole originally cut to allow operator to enter tank for welding end seams. This avoids excessive distortion which might be caused if the large opening were made all at one time

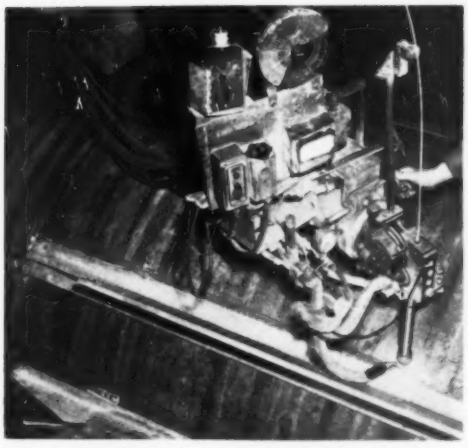
BUILDS TANK CARS FASTER

BY JAMES S. FREY, General Manager
General American Transportation Corp.

on 10,000-gal. 7¼-ft dia aluminum tanks, by gas-shielded arc welding



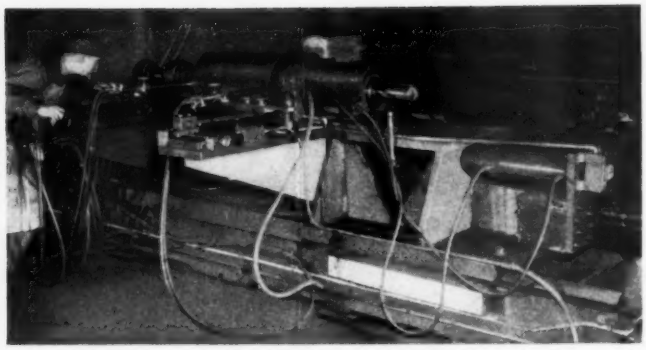
Girth seams of saddle-to-tank joint are machine welded after all inside seams have been made manually. Longitudinal seams are made in the same way, but corner radii must be welded by hand. Tank is turned end for end to make second girth seam because height of dome interferes with radial arm of machine



Anchor channels used for fastening the tank to center sill of the car, are welded on both sides to the tank by the fully-automatic machine Sigma process. A special extension tube permits welding between the anchors

Special Lathe Handles Flame Machining

BY CARL SHANK, Ass't General Supt.
DODGE MANUFACTURING CORP.



Designed specially for flame cutting ends of welded-steel, belt-conveyor pulleys to correct face widths, this lathe uses two oxyacetylene torches so both ends can be cut simultaneously. Thickness of pulley rims ranges from 5/32 to 1 in., depending on pulley size and application

WELDED-STEEL, *belt-conveyor* pulleys made at Dodge Manufacturing Corp. plant, Mishawaka, Ind., are flame-machined to length in a special lathe designed and built by Dodge tool engineers. This machine will handle pulleys 8 to 60 in. in dia, with 8- to 76-in. face widths.

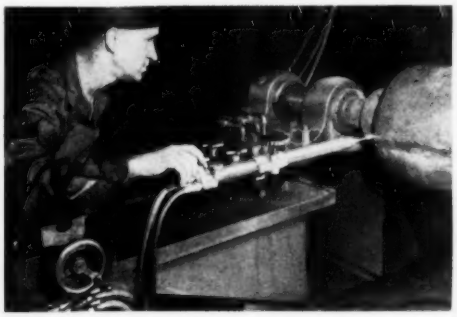
Of welded steel design, the lathe has a 38 x 176-in. fabricated base in which the ways are two 5 x 12-in. I-beams 176 in. long. At the center of the base, on the rear side, is a welded-steel pedestal which supports the Kinmont universal power unit used to rotate the pulley by forcing a 6-in.-dia rubber-tired drive wheel against its periphery. A variable-speed motor in this unit permits adjusting pulley rotating speeds from 6 to 25 ipm. A small air cylinder maintains constant pressure of the drive wheel against the pulley surface.

Headstock and tailstock units on the lathe bed are positioned by a leadscrew driven by a ½-hp gearmotor at 100 rpm. Right- and left-hand threads on the leadscrew insure spacing headstock and tailstock from the center of the bed, according to face widths of pulley to be machined. Steel platforms welded to headstock and tailstock bases support the Oxweld blowpipes with which flame-machining operations are performed. Clamp holders for the blowpipes are positioned accurately by screw-adjusted slides.

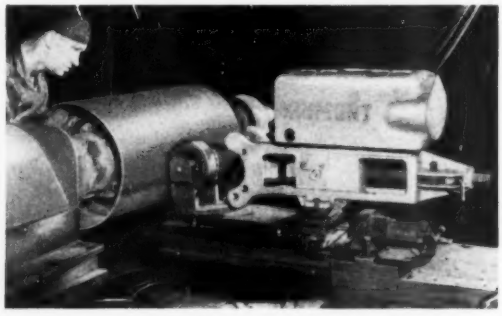
Position of the center spindle on the headstock is fixed, once its base has been adjusted to position along the ways. But, to facilitate loading and unloading, once the lathe has been set for a given size of product, the tailstock spindle is mounted on a slide so it can be withdrawn by an air cylinder. Separate valves control this cylinder and the one which controls the position of the friction drive wheel at the rear of the lathe.

Both spindles are supported in roller-bearing pillow blocks, and have hardened tool steel centers to fit into centering plugs bolted to the end flanges of the pulleys.

To insure high efficiency of the flame-cutting operation, both blowpipes have individual adjustments and controls. Special extra-length flame-cutting torches are used to permit adjustment of the tips to the correct distance from the pulley surfaces for efficient cutting, no matter what size pulley is to be machined.

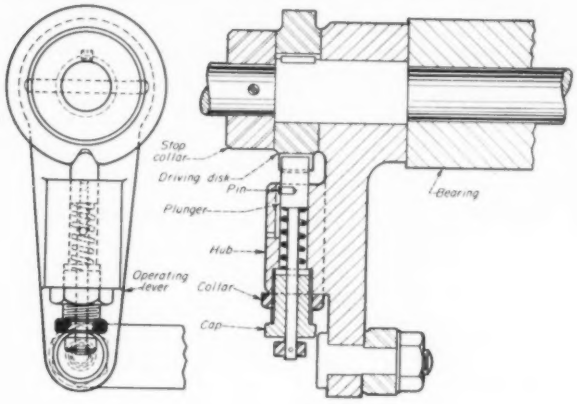


Flame-cutting torches with special long barrels are adjustably mounted on platforms welded to headstock and tailstock bases. Torches are set individually before pulley drive is started



Friction drive head on pedestal at rear of lathe uses adjustable-speed power unit and 6-in.-dia rubber-tired drive wheel. Air cylinder forces wheel against pulley periphery for traction. Sheet-steel guards across ways catch spatter and cutoff ends

Practical Ideas



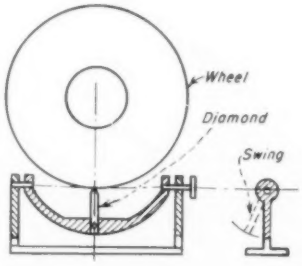
Overload Release Mechanism Has Adjustable Torque Resistance

INSTEAD OF INSERTING shear pins in a machine transmission to prevent damage during a sudden stop, we made this relatively simple but effective overload trip that has the same effect; but can be easily reset and does not require a new part each time it works.

The mechanism is inserted between the driving disk of the rotating shaft and the operating lever of the machine. The shaft goes through a bearing attached to the machine frame. Outside of this is the operating lever (not keyed), and outside the lever is the driving disk (keyed). Beyond the driving disk is a stop collar and pin that hold the assembly together.

A hub built onto the lever houses the overload mechanism. A spring-loaded plunger, with its end machined to fit into a groove cut in the driving disk, is fitted with a pin that rides in a vertical slot in the housing to prevent rotation. A hollow cap, through which the rod-turned end of the plunger works, threads into the housing, and is locked in place—after adjustment—by a collar.

Thus, torque from the shaft drives the disk, which reciprocates the lever through the plunger unless sufficient resisting force is present to overbalance the force of the spring to snap the plunger out of the slot in the disk. *W. M. Halliday, Southport, England.*



Cradle Dressing Rig Forms Grinding-Wheel Curves

BOTH CONCAVE AND CONVEX radii can be formed on the wheel of a surface grinder with this dressing attachment. Although it is a simple thing to make, it can be quite accurate—depending on the swivels and fits.

The curved arm, with a hole through its center to take a diamond holder, is swiveled on two support pieces built up from a plain base. Because the swivels must clear the wheel, the cradle is made at least 10 in. long to dress a 10-in. wheel. For other wheel sizes we use the same proportion. *Louis Dunch, Petersburgh, Ill.*

Six Shop Kinks For Your Notebook

HERE ARE A few shop kinks that we have found useful, as should many other shop men.

Wide screwdriver slots can be cut easily if two thin hacksaw blades are mounted in the saw instead of one.

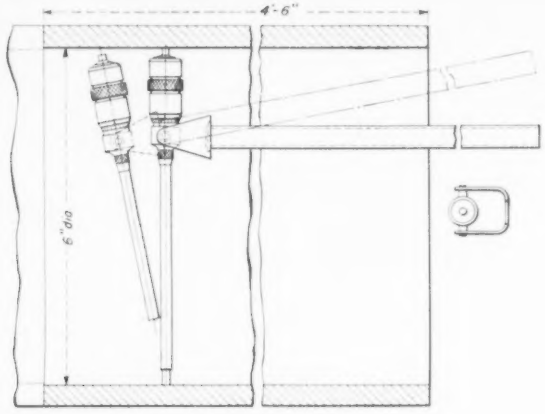
Square stock to be centerdrilled can be handled in a three-jaw chuck (in case a four-jaw one is not handy) by pressing it into a piece of pipe of thin-wall tubing which is chucked in the three jaws in the usual way.

Small turnbuckles or jackscrews can be made from solid stock for unusual applications by drilling, then tapping half the length with a fine-pitch tap; the other half of the hole with a coarse-pitch tap, so the differential in thread lead will provide some adjustment for tightening wires and braces. Eyebolts to match the threads are used in the assembly.

External threading on small parts can be done with a drillpress if a button-die holder is made out of cold-rolled steel to fit in a tapping attachment chucked to the spindle—but be sure to drill a clearance hole for the work up into the shank of the holder, above the die.

Loose jig bushings can be clamped in place by drilling and tapping a hole next to the bushing and assembling a screw to bear with its shoulder on the edge of the bushing.

A leak that develops while a babbitt bearing is being poured can be stopped by applying a wet rag to the spot. *Frank Biechele, Brooklyn, N.Y.*



Micrometer Crosshead Helps In Checking Long Bores

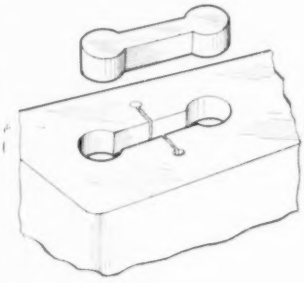
WE WERE RECENTLY INTERESTED in checking a small batch of long, bored tubes we had produced; but because the batch was small, we were not able to use extensive tooling for inspection purposes. The work was steel cylinders, 9 ft long, but to be bored to a 6-in. dia to a depth of 54 in. The wall was only 0.375 in. thick, so the out-of-round limit was 0.003 in. and the ID limit was 0.002.

Luckily, we had available three good inspection men, ones who were highly skilled in measuring with micrometers. We combined their skill with a simple micrometer holder to do the job.

A light steel crosshead was made to slip over two tapered pins added to an inside micrometer. This crosshead was spring steel, so it could be just snapped into position, where it would allow the micrometer to swivel.

A light tubular rod was attached to allow extending the micrometer into the bore the full distance. The micrometer was pushed into the bore, dragging its lower end, then was raised to the vertical by pulling back on the support rod. Measurements were taken each 3 in. This spacing was gaged by marks on the rod.

The technique was, as any mechanic will realize, a trial-and-error one; but it actually was fast and quite accurate. *C. D. MacKinnon, Lanarkshire, Scotland.*



Casting "Splint" Repairs Machinery Cracks

SPLIT CASTINGS can often be repaired if the fracture is small, by inserting a "splint" through the fracture.

First, a hole is drilled at each end of the split to spread out the stresses and to prevent the fracture from enlarging.

Next, a hole is drilled on each side of the fracture, square with the line of the fracture, and an equal distance away from the fracture. A saw cut, thinner than the diameter of the holes, is made between the holes.

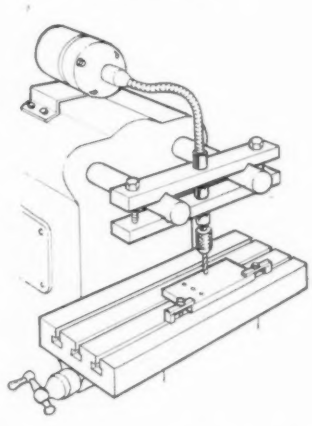
Finally, a shaped piece, cut to fit the sawed-out hole, is inserted. The shoulders on this insert may be slightly closer together than the shoulders of the cut-out hole, thus allowing the insert to pull the casting together across the fracture. It may be necessary to heat the insert to get it into the hole, but it will contract as it cools, drawing the casting tightly together. *Haim Murro, Jerusalem, Israel.*

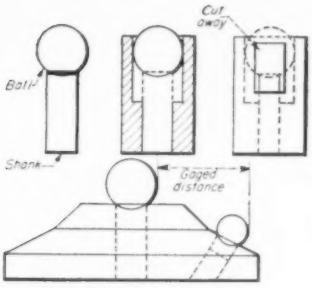
Makeshift Jig Borer Built for Under $150

FOR THOSE SHOPS without vertical milling attachments or jig borers, here's an easy way out: Mount a combined motor and variable-speed drive on top of your horizontal milling machine.

We did this to one of our machines. We made two blocks to clamp on the overarms—notched them to keep them centered, and clamped them together with bolts. Through the blocks we drilled holes in line to take the end of a flexible shaft attached to the drive.

A chuck was added to the shaft, and an indicator was chucked. Careful block-shimming was necessary to get the spindle exactly vertical, as indicated by the dial indicator. When this was done, we went ahead and did our drilling and boring, using table dials for measurements. Reaming was done by rotating the chuck by hand as the table was slowly raised. *Frank M. Butrick, Alma, Mich.*





Ball-and-Rod Gages Check Angled Holes

WE RECENTLY HAD a large boring job to complete. Two holes were to be bored in a casting at an angle to each other, and the distance between the holes had to be checked carefully. The measuring was done with ball gages that slipped into the holes. This method was accurate because the surfaces of the casting were accurate.

First, we made a gage for each hole. A bearing ball was taken with a short rod of smaller diameter, both slipped into a drilled and counterbored jig tube, and the two were soldered together. The jig positioned both ball and rod so they centered on each other exactly, and the jig was cut away on one face to allow soldering while the components were in the jig.

After assembly into the casting, the balls projected out of the holes. By application of simple mathematics, we could calculate what dimension we required between balls—both horizontally and vertically—and we could measure the distances between them with an accurate depth gage or micrometer. *R. G. Vare, Christchurch, England.*

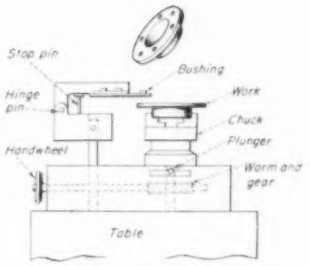
Drill Fixture Indexes

FOR DRILLING AND TAPPING a small number of holes, equally spaced around a workpiece, this fixture is useful. It combines an indexing work chuck and a drill-bushing plate.

The base is a large casting, bolted to the drill table. At one side of this casting, two vertical posts support the bushing-plate assembly. This is a simple, hinged device that can be lifted up and over to clear the bushing away from the work, or can be removed entirely by pulling the hinge pin. The bushing plate itself is held on by a couple of bolts in tapped holes—there being a number of tapped holes to allow for shifting the bushing back and forth for different jobs. The bushing plate is bolted to the bottom side of a flange welded to the bottom of the hinged member. A stop pin between the two members of the bushing-support assembly locates the bushing vertically and keeps it aligned. Screws through the lower part of the assembly bind on the support posts to hold the bushing plate at a given height.

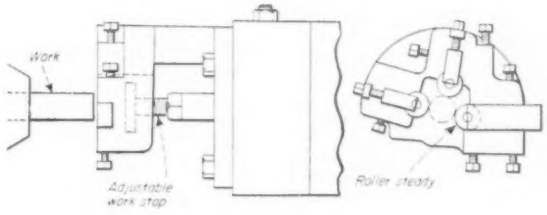
At the other end of the casting is the chuck support. The chuck is suitably braced with collars, but only a single spindle, which is vertical in the casting, actually carries the load. This spindle must be changed to suit each different number of holes to be drilled in workpieces.

At its lower end, it is held to a gear by a setscrew. The gear meshes with a worm that is driven by the handwheel. The gearing simply rotates the spindle, and thereby rotates the chuck.



Indexing, however, is done with the spindle. Above the gear on the spindle have been cut a number of radial holes. These number the same as the number of holes to be cut in the work, and are equally spaced around the spindle. A spring-loaded plunger, working from the front of the casting, fits into these holes to stop the spindle from rotating further once it has been brought into position by the handwheel.

Because the device operates at low speeds, all bearings are plain sleeve types, easily made, and easily kept lubricated. *M. Moran, Newark, N. J.*

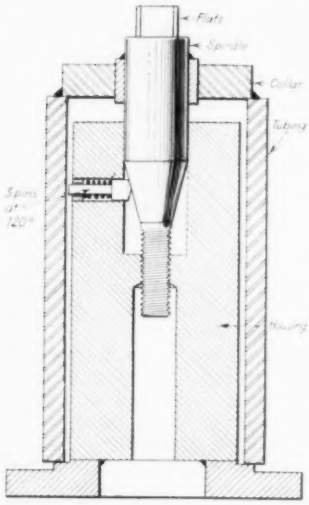


Extra Steady Roller Helps Center Work

WHEN WORKING on a turret lathe, I often had to use a mallet to knock the bar work true in the chuck. I overcame this trouble by fitting a standard roller steadyrest into a turret position, adding an extra roller, and fitting an end stop.

The extra roller was mounted at the end of a bar of about the same size as the tool normally used in the steady. After the three rollers were adjusted to center the work properly, an end-stop rod was located in the turret hole.

Work was fed out against the stop, where it was automatically centered. Then, the chuck was locked, the turret retracted, and the chuck operated. *Allan Clarke, Rochdale, England.*



Welding Fixture Centers Two Components

COLLARS had to be welded to the ends of tubes concentrically within 1/64 in. on a recent job. The trouble was that the ID of the tubes varied from lot to lot. To overcome this, we made a quickly adjustable tube-clamp fixture that would center both parts.

A stepped base was welded to a bored housing to hold the tubes. Radially through the housing wall, near the top, we drilled three equally spaced holes, inserted bushes, assembled small compression springs, and added shouldered pins. These pins had cone-faced ends, which were extended to grip the tubing by a tapered section in a spindle that fitted inside the housing.

The housing was bored and threaded below the pins, and the spindle was threaded to match it. The spindle was a slip fit on the housing above the pins. Where the spindle went through the collars, another bush was press-fitted and welded into place to center the collars. Because the collars were fairly accurate, this means of centering the tubes by means of the pins was adequate.

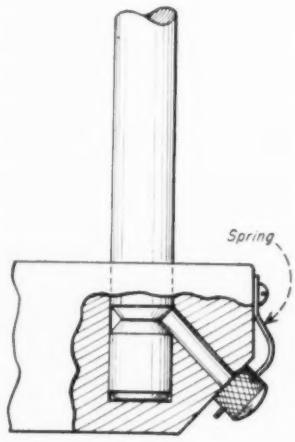
Operation followed this cycle: Load tube in place over housing, load collar, tighten nut end of spindle, weld, back off spindle, disassemble. *H. G. Frommer, Milwaukee, Wis.*

Quick-Release Pin Anchors Textile Rod

A TEXTILE MACHINE in our factory is equipped with a number of support rods which must be frequently removed and replaced. Although there is no tendency for the rods to rotate, they must be locked so they will not lift as the machine operates. The sketch shows a design that prevents motion, but allows quick rod removal.

The rod is V-grooved at its lower end, and a turned and faced pin is inserted at a 45° angle through a hole in the housing to nest in this groove. The pin, which is not threaded, is an easy slip fit.

Attached to the housing is a round-wire spring that assembles through a hole across the head of the pin. When the rod is to be removed, the pin is drawn back against spring pressure to release the rod. The pin need not come completely out of the hole; therefore, the spring remains with its end through the hole in the pin. After the rod is replaced, the pin snaps back in place because of spring pressure. *L. Kasper, Philadelphia, Pa.*



$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards, and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

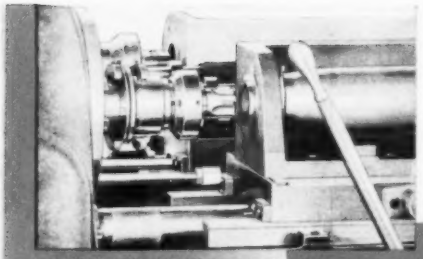
HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N.Y.

133rd Winner:

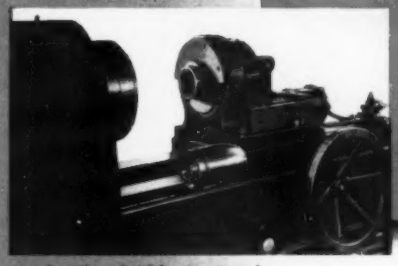
(For July 23 issue)

Peter Opanowicz

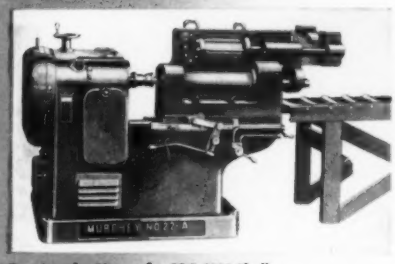
Hook Jaws Replace Parallels



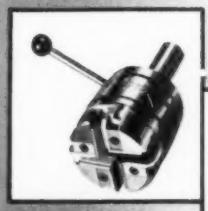
Tapping Two 75 MM Shells on a Murchey Double Head Shell Tapper using "L" Taps

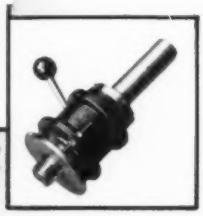


Murchey Thread Mill for Gun Barrels, Rocket Tubes and Breech Blocks



Tapping the Nose of a 105 MM Shell





Murchey Self-Opening Die Head and Collapsible Tap

THESE

Murchey Veterans

again in active service

ON DEFENSE PRODUCTION

These Murchey Threading Machines are ideally engineered for threading the components of guns and ammunition at maximum production rates and minimum costs. Their service record during the last war was outstanding. Now they are going back into active service on the same products.

When used with Murchey self-opening die heads and collapsible taps the combination affords several important advantages—

1. *Quickest job changeover.*
2. *More threads between chaser regrinds.*
3. *Longer chaser and tool service life.*
4. *Equalized chaser wear.*
5. *Less tool inventory.*
6. *Lower tool replacement costs.*
7. *Quicker tool adjustment.*
8. *Just one minute to replace chasers.*

If you are getting ready for defense work involving threading, get the suggestions of a Murchey Division engineer. He may be able to save you valuable time.

Lower Cost per Thread

MURCHEY DIVISION
OF THE
MURCHEY
SHEFFIELD CORPORATION
DAYTON 1, OHIO, U.S.A.

5758

Help Fill Empty Scrap Yards

The nation's steel mills are desperately in need of more iron and steel scrap. More steel scrap is needed today than ever before because steelmaking capacity is greater. It is due to reach 117 million tons in 1952.

Only management action in industry can help insure an adequate supply of scrap. Many industrial leaders have named a permanent "salvage committee" for their plants and yards.

Urge *your* committee to check every questionable piece of equipment, and list all obsolete dies, jigs and machines. Then call your scrap dealer.

Remember, scrap resulting from current steel production isn't nearly enough to do the job.

ARMCO STEEL CORPORATION

4421 CURTIS STREET, MIDDLETOWN, OHIO • PLANTS AND SALES OFFICES FROM COAST TO COAST • EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO

American Machinist

Machinability of Titanium 150A

FROM THE U. S. AIR FORCE MACHINABILITY REPORT—1951. COURTESY CURTISS-WRIGHT CORPORATION

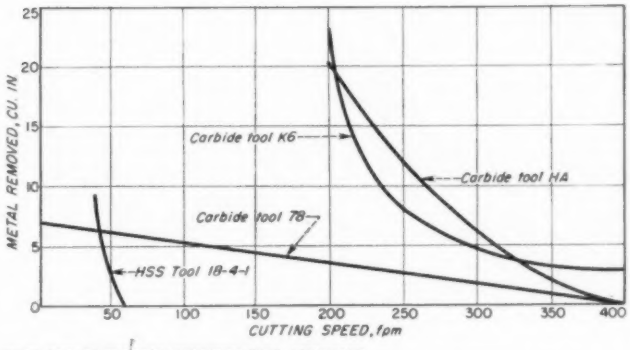
(See also AM, June 11 Special Report)

MILLING—Surface speeds should be around 70 fpm. In HSS, 18-4-2 types seem best, and cast-alloy cobalt-chromium tools superior to carbides. Carbide bits tend to flake from intermittent cutting and welding of chips. On compressor blades (Ti-150A), Tantung side and end mills at 90 fpm (4-in. OD, 75 rpm), tool life is about 150 pcs per grind. With Vasco Supreme (18-4-1) end mills, ends of 1¼x1½-in. bars are milled square to length at about 50 fpm (2¼-in. OD cutter, 92 rpm) with 0.125 in. depth of cut and 1 ipm table feed. Tool life is about 120 pcs per grind (25 cu in. of metal removed).

In Lockheed tests, cutting speeds from 20 to 720 fpm and feeds from 0.004 to 0.016 ipt were tried. A 4-tooth KM carbide-tipped endmill (6° neg axial rake and 6½° clearance) at 21 fpm, and 0.006 and 0.008 ipt feed with lard oil, dulled quickly. With no cutting fluid, at 46 fpm and 0.008 ipt feed, the tool cut well for a short time, then heated extremely and broke down rapidly. HSS side mills, plain and chromium-plated, broke down quickly at 27 to 31 fpm and 0.004-0.005 ipt feed.

Final tests were with a 6-in., 6-tooth Carboloy-tipped side mill with 2½° neg radial rake and 6° neg axial rake. With the test piece in a bath of solid CO_2 and tri-ethyl-phosphate (–100F), speeds from 31 to 69 fpm at 0.005 to 0.008 ipt showed no tool wear. At 30 fpm and 0.016 ipt, and at 89 fpm and 0.013 ipt, wear was slight but finish coarse. Tests at higher speeds gave progressively poorer results, a test at 720 fpm causing serious tool damage.

TURNING—Lockheed also ran a variety of turning tests, using styles AR10, BR10, and D10 Kennametal tools (0°BR, 6°SR, 0°SCEA, 6°ECEA, 6° Relief). Four initial tests were made at feed of 0.010 ipr, depth of cut of 0.030 in., 35 fpm cutting speed, with oil as a coolant. 55 sq in. of surface were machined. K6 (hard, cast-iron grade) and K25 (cast-steel grade) showed practically no wear. K3H (steel-cutting grade) and KM (general-purpose grade) showed medium tool wear. K6 was then tested at 0.020 ipr feed, 0.06 in depth of cut and 100 fpm. In cutting 95 sq in. of surface, the tool cratered badly and finish was rough, but machining rate was about 12 times as great in cu in. as in the previous test. In a final finishing test, K6 was fed at 0.010 ipr, with 0.0025 in. depth of cut and 120 fpm. Wear was very slight in a 120-sq in. cut and finish was 100 micro-inches—as good as on the original tests.



TOOL LIFE IN CUTTING TITANIUM 150A ANNEALED
HSS Tools (0°BR, 15°SR, 0°SCEA, 5°ECEA, 5° Relief, 0.010-in. nose radius) gave 9 cu in. tool life at 40 fpm with 0.009 ipr feed and 0.062 in. depth of cut. 25:1 water-soluble cutting fluid. Carbide tools gave 10 cu in. tool life at 200 fpm, with feed about 0.012 ipr. Cast-iron grades of carbide seem to give best results. (Carbide tool angles: HA and K6 as for HSS but with 0.005-in. nose radius; No. 78—0°BR, 6°SR, 0°SCEA, 6°ECEA, 6° Relief, nose radius 0.040 in.)

CUTTING OFF—Abrasive sawing thus far seems best. The blade must not plunge-cut straight through, but must cut a series of shallow scallops to keep contact area as small as possible (prevents clogging) and give coolant maximum access. Work should be slowly rotated or indexed so the wheel need not cut more than halfway through. Oscillating wheel-head motion is excellent. Coolant flooding is advisable to prevent heat cracking because of a low heat conductivity of Ti. A 7-in.-dia bar was cut by rotation and oscillation in 10 min. (14.2 sec per sq in.), a 1-in.-dia bar in 4 sec. Wheel speeds of 3000 to 4000 fpm, rather than the usual 5000 to 6000, seem advisable to reduce wheel wear.

Hacksaws should be very coarse (2 to 4 tpi) and run at slow speeds and heavy feeds. Ordinary saws and feeds give small feeds per tooth, result in rapid work-hardening.

DRILLING and TAPPING—Cutting must be continuous to prevent work-hardening. Pilot holes are inadvisable because of this. Poor thermal conductivity and tendency to chip welding, plus a tough, non-curling chip, require eccentric drilling and stagger-tooth taps (60% thread, 12-15 fpm). Drills of the high-cobalt type with notched lips, run at slow speeds and double usual feeds, look best. An undersize drill, with point ground off center, will run out and drill a larger hole, minimizing rubbing, reducing pickup and heating.

Now Available

NEW CLASS H* MOTORS PROTECTED BY DOW CORNING SILICONES

. . . the insulation that has already saved industry millions of maintenance dollars plus the hourly output of hundreds of thousands of men!

This most timely announcement caps the test program we started 8 years ago when silicone resins were introduced by Dow Corning Corporation. First we proved by accelerated life testing that silicone insulated motors had a good 10 to 1 advantage in life expectancy and wet insulation resistance. Then we sold silicone (Class H) insulation to the manufacturers of electrical equipment ranging from lift truck and traction motors to solenoid and brake coils. We also encouraged the better rewind shops to rebuild hard working industrial motors with Class H insulation.

Now we can proudly refer American industry to this goodly list of electrical manufacturers, all able and willing to supply electric machines protected by Class H insulation made with Dow Corning Silicones.

Take your special problems to the application engineer representing any of these companies or to our Product Development Engineers. DEPT. AW-10.

furnished by:

ALLIS-CHALMERS MANUFACTURING COMPANY

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THE B-A-WESCHE ELECTRIC COMPANY

WESTINGHOUSE ELECTRIC CORPORATION

THE MASTER ELECTRIC COMPANY

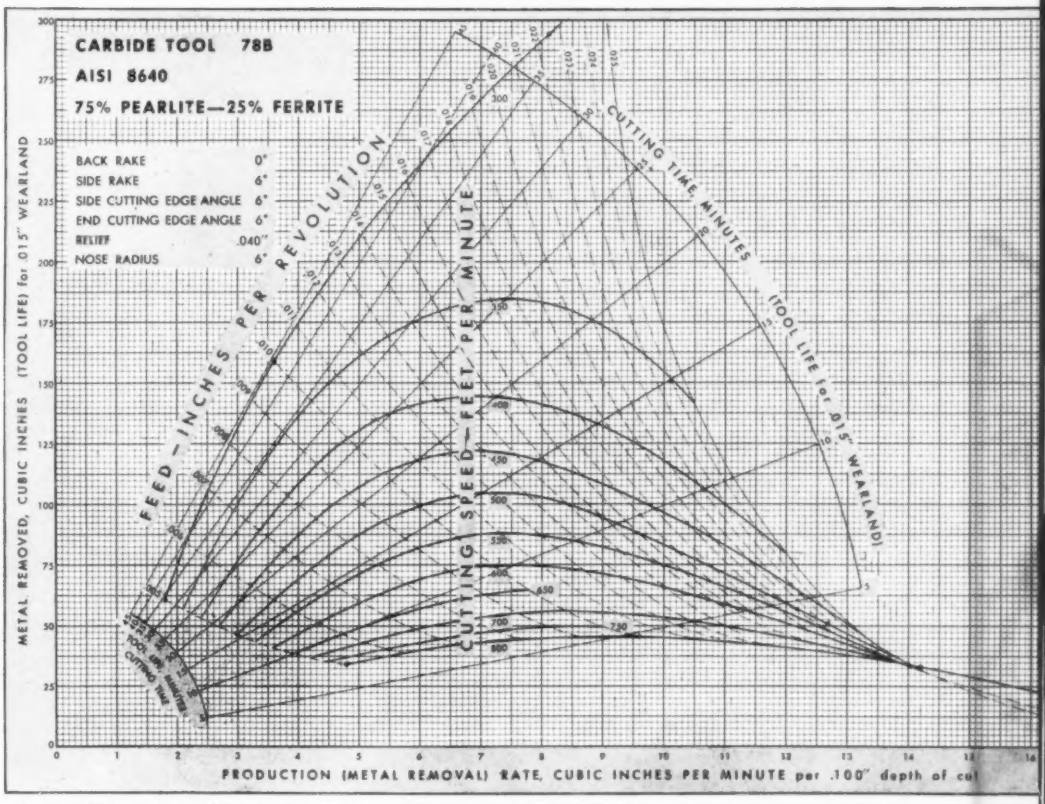
*"Class H" insulation is the kind of insulation that keeps motors running in spite of "Hell and High water." (slanguage dictionary)

DOW CORNING CORPORATION

DOW CORNING SILICONES

MIDLAND, MICHIGAN

Production Rate Chart for AISI 8640


CARBIDE TOOL 78B
AISI 8640
75% PEARLITE—25% FERRITE
BACK RAKE 0°
SIDE RAKE 6°
SIDE CUTTING EDGE ANGLE 6°
END CUTTING EDGE ANGLE 6°
RELIEF .040"
NOSE RADIUS 6°
METAL REMOVED, CUBIC INCHES (TOOL LIFE) for .015" WEARLAND
FEED—INCHES PER REVOLUTION
CUTTING SPEED—FEET PER MINUTE
CUTTING TIME, MINUTES
(TOOL LIFE for .015" WEARLAND)
PRODUCTION (METAL REMOVAL) RATE, CUBIC INCHES PER MINUTE per .100" depth of cut

Tool-life, production-rate chart for AISI 8640 shows the combined effects of feed and speed on tool life. To use this chart: (1) select the cutting speed and feed, (2) find the intersection between the feed and speed curves selected; (3) to find production rate, draw a vertical line downward; to find quantity of metal removed, draw a horizontal line to the left, and to find the cutting time, find the nearest radial line. Example: cutting speed = 400 fpm; feed = 0.015 ipr. Then, production rate = 7.25 cu in. per min.; tool life = 145 cu in

How to Use the Alignment Chart on Page 183

The alignment chart (p 183) consists of three parts:

1. Any straight line across the *F*, *D* and *A* scales instantly provides the product of feed and depth, the section area of metal being removed.

2. A second straight line from *A* across *S* to *PR* gives the product of section area and cutting speed: production rate, cubic inches per minute.

3. Likewise, another line from *PR* to *Q*, crossing *T*, relates production rate and cutting time with their product, the volume of metal removed.

Sample solutions show how to use the chart and, incidentally, give the values of the basic settings for the majority of the tool-life tests with carbide tools reported in the Curtiss-Wright Machinability Report in this issue.

Tool life, both in terms of the actual cutting time in minutes, and volume of metal removed in cubic inches, is represented by the two right-hand scales when related to the work produced by one particular tool, cutting on a specific work material. In order for tool-life data to be complete, tool material, tool angles and degree of tool wear should be stated. Required also are the work material, microstructure and hardness; the feed, depth of cut and cutting speed; cutting fluid, if any, and all other possible variables in the setup. With such data it is possible to make accurate estimates.

If your plant uses machine tools with tableways

YOU CAN'T AFFORD NOT TO READ THESE STATEMENTS

188 metalworking concerns which buy all their other lubricants from our competitors insist on the use of Sunoco Way Lubricant. *They* tell *us* no other refiner has a comparable product.

38 leading machine tool manufacturers approve or specifically recommend the use of Sunoco Way Lubricant on the tableways and slides of their metalworking equipment.

5 different metalworking problems have frequently disappeared as if by magic when Sunoco Way Lubricant was applied. Most such problems, while attributed to other causes, were proved to be the result of the use of inadequate tableway lubricants. Sunoco Way Lubricant has eliminated trouble supposedly caused by *poor machine tool design* and *deficiencies in hydraulic drives*. Sunoco Way Lubricant also has cleared up *inability to hold close tolerances* and has put an end to *poor finishes* and *scoring of ways*.

Want to see factual case histories and learn more about this product? Send for illustrated booklet, "Sunoco Way Lubricant." Samples are available, too, to companies in the metalworking industry. Write Dept. AM-10.

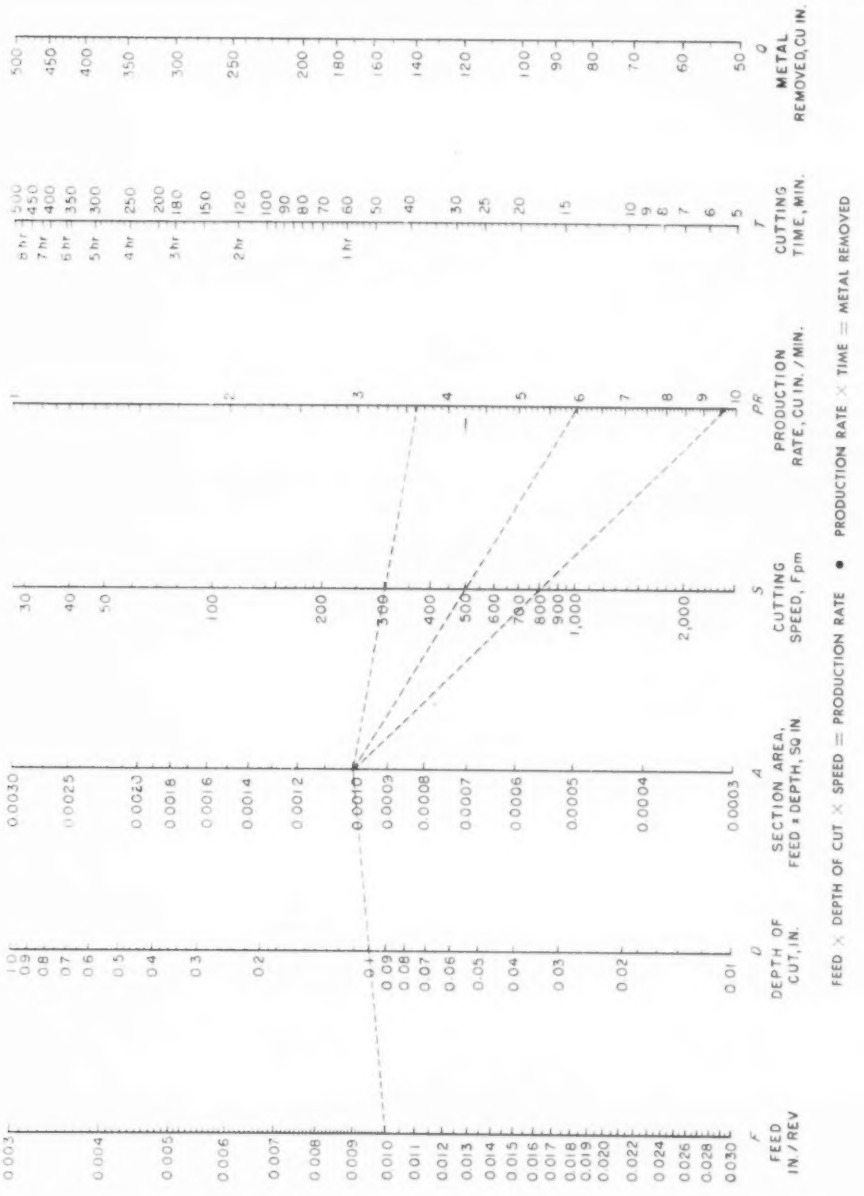
SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO®

Alignment Chart for Production Rate

From the U.S. Air Force Machinability Report—1951 • Courtesy Curtiss-Wright Corporation


D METAL REMOVED, CU IN.
T CUTTING TIME, MIN.
PR PRODUCTION RATE, CU IN. / MIN.
S CUTTING SPEED, Fpm
A SECTION AREA, FEED x DEPTH, SQ IN
D DEPTH OF CUT, IN.
F FEED IN / REV
FEED × DEPTH OF CUT × SPEED = PRODUCTION RATE • PRODUCTION RATE × TIME = METAL REMOVED

See page 181 for explanation, and also the tool life vs. cutting speed chart for 12 steels (inside of Special Report, pages 161-168)

Lusol
METAL WORKING SOLUTION
Every day you hesitate to try this completely different metalworking solution, you lose the difference between average and exceptional production.
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Proof: • is contained in the 20-page book, "LUSOL—the all-chemical Metalworking Solution". It's free, and so is enough Lusol to compare against any cutting fluid you now use. Simply write: F. E. Anderson Oil Company, 215D, Brownstone Avenue, Portland, Connecticut.
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GETS TO THE POINT
Lusol
ALL-CHEMICAL METALWORKING SOLUTION
GETS TO THE POINT

TALKING SHOP

Exploration

SOME MONTHS AGO, Sinclair threw open its research labs to inventors with a new petroleum product or application. More recently United Dye and Chemical Corp. has offered its facilities and experience to *companies* and individuals with chemical problems or practical chemical ideas. The purpose is to further chemical product research and development. Special company group evaluates ideas submitted; selects feasible projects to undertake "on a mutual basis."

The idea is sound. It provides men and companies with ideas a chance to have them developed by specialists—and gives the specialists some outside shots in the arm.

America's Storehouse

CANADA seems to be North America's mineral storehouses for tomorrow. In recent months we have heard of new and rich discoveries which included: copper in Quebec, sulfur in Alberta, wax from Saskatchewan, lignite, plus coal, oil and iron. Perhaps part of this is a result of the current "Uranium-rush." Our northern neighbor is coming into its own as industry multiplies there.

Coolant Race

MANY COMPANIES, it seems, are working hard on the coolant problem. New compounds, new additives, new methods of applying coolant—all these are now being made available. Each has its advantages; many show amazing gains in tool life, possible feeds and speeds, finishes. The "standard" coolant may no longer be the answer on specialized production. Some modern alloys are impossible machining jobs with standard coolants.

Two-Way Protection

GE IS INSTALLING at Schenectady the first two-way radio system exclusively for plant protection. Built at Electronics Park Plant of GE in Syracuse, the network will include 35 base stations in guard posts throughout the 600-acre Schenectady works, and 7 mobile stations in plant police cars, fire trucks and ambulances.

Mixed Metal

TO GIVE IT its steelmaking (and German) name, "mischmetall," the alloy which helps to remove sulfur, gases, and oxides from high-quality steels, and to prevent flaking and bleeding, is really quite something. The elements are cerium (initial use to prevent seasickness), neodymium and praseodymium (used in glassblowers' goggles), and lanthanum (used to absorb gases in radio tubes). When alloyed 35% iron, mischmetall 65%, the product is Auer metal, or artificial flint for cigarette lighters and light-intensification in arc lamps.

Atoms Over the Counter

AT THE CORNER of Fifth Ave and 42nd St, New York, is America's first Atomic Age department store. There you can buy radioactivity detectors (Geiger counters, etc.). Our national penchant for advertising shows up in the names: "Sniffer", "Snooper", and "Ferret" for prospectors; "Classmaster" for school use; "Civion" for civil defense workers. Others are the "Cutie Pie", "Zeuto", "Professional", and "Scintillometer", the latter for use from low-flying planes.

Three-Dimensional Movies

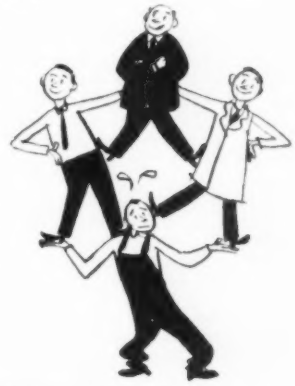
AMONG RECENT PROCESSES developed at Wright Field is a new method of projecting 3-dimensional movies. Alternate frames are offset to right and left, and viewers wear polarized spectacles. Thus only one projector and one screen are required. A barrel-shape polarizer on the projector diverts pictures to the proper eye.

Several metalworking companies, faced with difficult problems to explain by conventional means, are planning or producing 3-dimensional movies or slides to do the job better and quicker.

Thunderjet Flood

WHEN KANSAS FLOOD waters engulfed the old GM plant that built B-25 Mitchell bombers in World War II, they covered 375 machine tools being moved in to work on the F-84 Thunderjet fighter. Machine tools set in place—about 40—had been waterproofed and greased, the others moved to highest available ground. They still got wet.

So when the flood receded, the Air Force rushed in four high-pressure steam generators and 12 engine preheaters from Tinker Field. With these, machine tools were cleaned, then thoroughly dried to prevent corrosion. Some machines had to be sent back to the Reserve at Omaha, but many could be cleaned up in place.



Manpower Troubles

WHAT CAN YOU DO when the ratio of indirect to direct labor gets too high? One manufacturer has come up with a solution that differs from any we've heard of yet. Essentially, it amounts to reducing production schedules enough to bring manpower down to the point where indirect labor is about right for original activity. Production workers then were brought back but foremen were not permitted to add anyone to the indirect-labor payroll. Foremen who previously had considered it impossible to operate with fewer indirect operators than they then had soon found ways to eliminate waste effort and to run their departments smoothly with the proper balance of manpower.

News of Metalworking

• **BORON STEELS** can be used successfully in shafts, gears, tractors, armor plate, steelmakers have found. Defense Dept. reports that boron steel is expected to be used widely as a substitute for scarce nickel, chromium, vanadium and molybdenum.

• **A TIN SUBSTITUTE** for use in cans has been developed by Reynolds Metals Co. Aluminum sheets are coated with plastic and then bonded under heat and pressure. Production of the new material is starting immediately.

• **COST SAVINGS** averaging 63% have been obtained by replacing three metal gears on GE oscillating fan with molded nylon gears produced by the Taunton, Mass., molding plant of General Electric's Plastics Dept. Hobbing, cutting and assembly operations are eliminated.

• **"DISASTER CONTROL,"** a new 16mm McGraw-Hill sound motion pictured based on AMERICAN MACHINIST's famous report, has been released. The 21-min film indicates setup and duties of plant defense coordinator, fire fighting units, police or security dept., sanitation control group, salvage unit, air raid warden service, communications units. Price: approximately $100.

Attempts at Arms Standardization For European Defense Bog Down

WASHINGTON — US military experts are bogged down in an attempt at arms standardization. They're trying to reach a common ground on specific weapons, groupings of weapons, fuels, lubricants, supplies, spare parts, packaging, markings, methods, military tactics, for armed forces of countries that may be fighting side by side.

There are two standardization programs going on simultaneously. One is the ABC (American, British, Canadian) program whereby military experts develop requirements for a weapon—what they want it to do. Then the weapon is developed according to these requirements.

Progress under ABC has been good. But these are the weapons of tomorrow—the secret and super-secret stuff.

Because of the growing need for hemispheric defense, Canada recently standardized virtually all her weapons with the US.

• **Canadians are buying** US tanks, rifles, planes, automotive equipment, and spare parts. Canadians are also manufacturing for their own use the F-86 North American Sabrejet. US is buying T-36A Beach training planes from Canadair Corp. Current orders exceed $50 million in AA guns from Canadian firms. All these fit into the standardization program.

While standardizing arms with Canada has run smoothly, standardizing under NATO requirements has been a headache. Trouble is that standardization includes not only adoption of arms for immediate tactical use, but gets into production schedules as well.

Under NATO, participating countries have a standing group in the Pentagon. Their object is to figure out the military needs and requirements for Gen. Eisenhower's forces. Once that's done, comes the problem of where to get the munitions and supplies. US military authorities want to make sure that European countries are contributing to the NATO program.

That's why the European Defense Production Board was set up. Under International General Electric's William Herod the board has to figure out what items and components European industry can supply.

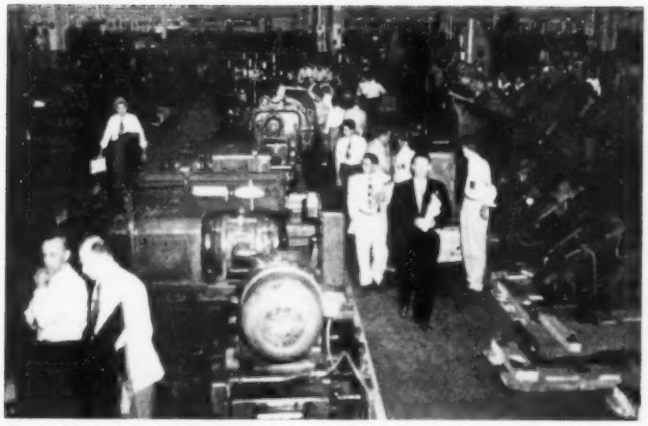
Each member of NATO has a representative on the board. William Batt, ECA administrator in London, is the US member.

NATO countries have reached agreement to date on: acceptable types and groupings of fuels and lubricants for tactical equipment; packaging requirements and markings; a 24-volt electrical system for military vehicles; military requirements for tactical vehicles; uniformity of spark plugs; radar and electronics equipment; virtual adoption of US automotive equipment; screws and threads; electrical and electronic equipment.

• **Biggest single advancement** was made with the agreement on ammunition sizes. Right now, western nations are standardizing with US ammunition calibers.

Top issue under consideration now is the question of small arms. The British have developed a .280-cal rifle that weighs only slightly less than the US M-1 Garand. But it utilizes a lighter weight ammunition that will permit the foot soldier to carry about twice as many rounds. However, US military men consider the Garand more effective.

"Let's Get In the Scrap" was theme of employee scrap drive recently concluded by Lyon Metal Products, Inc., Aurora, Ill. Here a Lyon's supervisor talks with scrap dealer about some of the scrap turned up in the Lyon plant. The successful drive is being repeated at Lyon's York, Pa., plant



First group of USAF prime and subcontractors (above) make an on-the-spot selection from reserve tool pool at Marietta, Ga. In photo at right, a contractor jots down his name to tag the scarce machine tool he wants

Thar's Gold in That Thar Tool Pool

MARIETTA, Ga.—"Operation Gold Rush" is the name applied to a new technique of getting reserve machine tools into defense plants—and, incidentally, out of the Lockheed bomber plant here. Begun three weeks ago on Sept. 10, over 20% of the 6546 available tools were allocated in the first two days. Visitors obviously were not finding the "obsolescence," previously reported from the Reserve. And a force of 600 men, working around the clock, started them on their way to their new users. Monitoring the project is the USAF Industrial Equipment Section, Production Resources Division.

The Operation consists essentially of bringing in by air representatives of defense contractors in groups. Some 300 men, from 178 plants, arrived in Atlanta Sept. 10 as the first group. Companies represented included General Electric, Budd, Buick, Bendix, Eclipse-Pioneer, Studebaker, Delco, Frigidaire, Firestone, Avco, Otis, American Machine & Fdry, Evans Products, and the like.

• **These men were briefed** at the Hotel Atlanta by Anton Dekom of of Air Force, then driven the 18 miles to Marietta and allowed to wander through the ½-mi-long plant. There machines were set out, each bearing a tag on which the visitor might write his company name if he wanted the tool.

By Monday night, 748 machine tools had been selected — some of them having several names on the tags. Tuesday, another 658 were tagged. Then a special Air Force priorities board reviewed the selections—and Wednesday morning the men returned to see what they had been awarded and to arrange for its transportation. Awards were made on a strict priority basis—best machine to highest priority—regardless of the sequence of names on the tag.

That night, three chartered DC-6 airliners carried 198 men of the party onto Omaha, to the other Air Force reserve.

Meanwhile, at Marietta, a second group of 98 visitors was arriving, representing 200 more defense contractors, plus five Canadian firms. This group picked 646 machines. A third group of buyers selected 181 machines.

Detroit Broach found a deep-hole drill that will make it unnecessary to subcontract such drilling—at $140 a hole. New Process Gear (Syracuse) found two $225,000 upsetters which otherwise would have been on order for months.

• **And the machines are going out**—fast. The NC & S & L Railroad has provided special switching, local trucking firms are swamped. One visitor even brought three 40-ft wheat trucks from his native Arkansas to take back his selections.

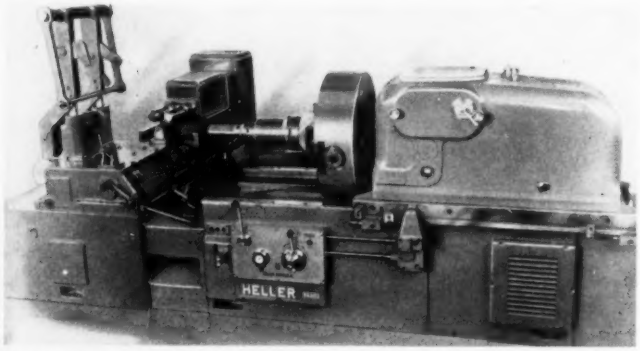
Tough Times Loom for Shipyards

WASHINGTON—The nation's shipyards may be faced with tough times. Reason is that structural steel sizes and shapes, the ribs and backbone of a ship, are not going to the yards. And too, plates and tubes are holding up construction and repair. Add to this the loss of skilled men to higher paying industries and you get trouble for the shipyards.

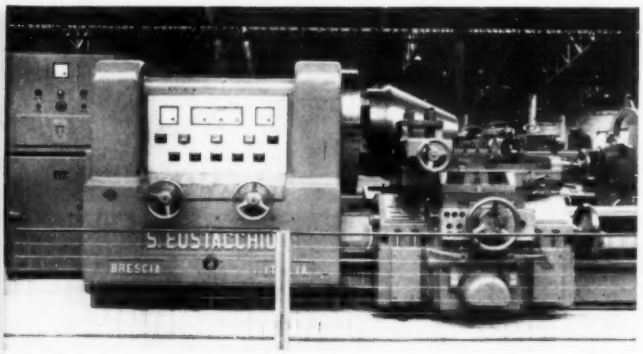
Right now, there are 67 ocean-going vessels on order in US yards. That's a gross tonnage of 1,170,050 tons of shipping. By types, the ships are divided into: one passenger liner; 29 tankers; 35 freighters; three troopers; and two seatrain vessels (carrying rail cars). There are another 20 vessels on order at inland yards with a total tonnage of 324,900 deadweight tons, almost all of them ore carriers.

• **Main interest** in the shipbuilding program right now is the new Mariner class ships under the $350-million government program. Thirty-five of these vesels are on order for the government in private yards. So far, this is the biggest federally-sponsored shipbuilding program in the nation's peacetime history. It calls for a total of 50 cargo ships that will carry more than twice the cargo of World War II's Liberty class, and move twice as fast — twenty knots or better.

Shipping circles feel these ships are just the beginning of a new program to modernize the fleet. Navy men tipped their hand with the statement that if the US was to rely solely on war-built Liberties and Victories, we would be "fighting a 22-knot war with a 10-knot supply line." In short, they want a faster merchant fleet.



Special-purpose 3-spindle borer, shown by Heller of Germany, accomplishes roughing, finishing, and facing of bearing and cylinder bores of tractor crankcase in one setting. Floor-to-floor time is 15 min



Large lathe of San Eustacchio, Italy, features electronic control of spindle speeds through mercury-arc rectifier. Speeds are selected through potentiometers, manipulated from headstock and carriage

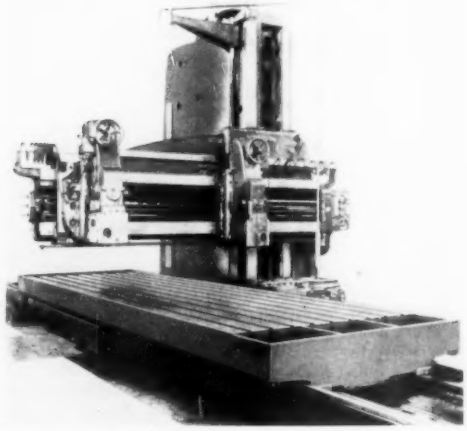
Machine Tools

PARIS—Thirteen nations were represented in approximately 800 exhibits at the first European Machine Tool Exhibition held here Sept. 1-10. Largest number of exhibitors were French and German. Switzerland, Belgium and Italy were also strongly represented, and there were exhibits from the Netherlands, Sweden, Denmark, Austria, the Sarre and Monaco. Only a few British and American exhibitors participated.

It was a first-class exhibition of machine tools, in the impression of many who attended, and a successful kick-off for subsequent shows to be held annually, sponsored by the Comite Europeen de Co-operation des Industries de la Machine Outil. Next year's show is planned for Hanover, then Brussels in 1953, Milan in 1954, and Paris again in 1955.

• **Some 2000 machines,** large and small, were under power at the show, with a large number operating on actual or test jobs. Some 50 of the machines weighed over 20 tons each. Progres Industriel of Belgium displayed a lathe weighing 100 tons. A lathe by San Eustacchio of Italy has a center height of 600 mm, with distance between centers of 6000 mm, and weight of 30,000 kg. A large Schiess double-column boring mill will take work up to 3800 mm dia and weighing up to 18 tons. The 60-ton machine provides a maximum clear height of 2000 mm.

Allen-Bradley President F. F. Loock (second from right) talks with M. Pouvereau (left) past president of French machine tool assn.; M. Louvel, French Minister of Industry & Commerce, and Arthur Rocke, Allen-Bradley export mgr



Two-way open-sided planer, shown by Berthiez of France, has maximum table speed of 325 fpm

of 13 Nations at Paris Show

Another impressive machine was a prototype French G.S.P. radial drill, having a drilling capacity of 110 to 155 mm, and 3350 mm radius. Charles Berthez of France showed, among other heavy machines on its stand, 13,500-kg boring mill with electronic copying equipment, and a 50,000-kg planer designed to cut in both directions, with table speeds up to 100 meters per min.

This machine was cutting at high speeds and heavy feed on steel, using a single two-way cutting carbide tool on the left-hand slide. The other slide carried a multiple tool for operating on cast iron. The multiple tool holder carried seven tools, one set of three facing the front and the other set the rear, cutting alternately on forward and reverse strokes. Each tool in the set of three was staggered laterally and ground to cut three shallow V-shaped grooves in the face of the work.

• **A considerable number** and variety of makes of centerless grinding machines were shown at the exhibition. An interesting set-up was shown on the No. 4 machine of A. B. Malcus Holmquist, Halmstad, Sweden, with a capacity for grinding work up to 6 in. dia. The machine was equipped with automatic feed comprising a double chute and push-feed device.

The Dutch firm of N. V. Nederlandsche Machinefabriek, Artillerie-Inrichtinger, of Zaandam, showed a capstan lathe featuring a pre-loaded roller mounting of the capstan slide for sensitivity and ease of operation. Twelve spindle speeds from 300 to 4750 rpm are obtained through a three-speed reversible motor and V-belt drive. The machine has a center height of 5¼ in., with swing of 7 in. over the cross slide. The turret has six tool positions.

A prototype openside planing machine of 1.25 by 1.0 by 4.0 meters capacity was shown by Safak S. A. Selessin-Liege, Belgium. Plastic sliding surfaces are fitted on the underside of the table, and hydraulically operated feed motion to the tool slides. Tool holders have hydraulic relief to clear the work on the return stroke, and there are hydraulic cylinders for arresting the table traverse, for precision. Table speeds range from 3 to 60 meters per min.

• **A fully automatic arrangement** for rolling the thread on a socket head screw, and knurling the head at the same time, was shown by A.-G. Pee Wee—Grob, Konstanz, Germany. Screw was 12mm dia by 35-mm long. Screws can be knurled and threaded at rate of 1800 per hr.

Accuracy within 0.002 mm is claimed for the Isomatic bush turning automatic exhibited by Andre Bechler S. A., Moutier, Switzerland. The machine can be equipped with four or five radial slides. Bechler also exhibited cam-slotting machines, cam-machining attachment, a cam micrometer, and a pinion-cutting machine with automatic feed for cutting small watch pinions and components for measuring instruments.

Application of copy profiling technique, as applied to lathes, boring machines, milling machines and even a planer, was an outstanding feature of the exhibit staged by Schiess AG., Dusseldorf, Germany.

Self-contained copy profiling attachment developed by Cazeneuve, of France, was applied to one of the firm's lathes. Device is said to give the lathe production possibilities of a special machine while preserving its universal character

• **Among numerous copying** devices of all types shown was that of Cazeneuve of France, applied to a lathe. The equipment embodies motor and pump, oil reservoir, tool slide, hydraulic piston and valve, tracing finger, and heads for mounting the master piece or former to be used. Centers carrying the master components are bolted to the T-slots in the rear face of the lathe bed. Work up to the maximum length admitted by the lathe can be machined using this copying device.

A simple universal cylindrical grinder with mechanical drive was shown by M.S.O. Maschinen- u. Schleifmittelwerke, A.G., Offenbach, Germany. Capacity is up to 7¾ in. dia. and the machine comes in three sizes for work 21½ in., 31½ in., and 41 in. between centers.

Among American machine tool builders at the Paris Show was E. W. Miller (left), president of Fellows Gear Shaper Co., shown here with his Paris representative, Charles Welte

British Machine Tool Trades Assn. President Robert W. Asquith (left) is shown with W. J. Morgan, MTTA general manager, and J. A. Bradner (right), president of Lees-Bradner Co., Cleveland

John S. Chafee

Sven Vaule

Frederick Nueske

M. E. Peterson

Names in the News

John S. Chafee, vice president and director of the Saco-Lowell Shops, Biddeford, Me., has resigned, but will continue as consultant for the company when needed. **Sven Vaule,** consulting management engineer, who discontinued his practice of 1949 temporarily to become works manager at Saco-Lowell in Biddeford, has also resigned to resume general practice, although Saco-Lowell will continue as one of his major clients. Mr. Vaule's offices will be at 1 Mitchell Road, South Portland, Maine. Mr. Chafee went with Saco-Lowell in February, 1946, after 3½ years with the WPB in Washington, latterly as director, Tools Division and previously a vice president of Brown & Sharpe. He is a past president of the National Machine Tool Builders Assn. He brought with him Mr. Vaule, who began installation of improved manufacturing controls as a consultant. To facilitate these changes and others (See *AM*, April 16, 1951, p47), Mr. Vaule became works manager in 1949. He had previously done consulting work for major manufacturers of machine tools, diesel engines, and radio equipment. Under their direction, the Biddeford plant was modernized and a new plant begun. The new plant will be occupied this month. **Elmer J. McVey,** formerly of H & B American Machine Co., who has been with Saco-Lowell since early this year, will succeed Mr. Chafee.

Harry L. Brindle has been appointed assistant to vice president-manufacturing, United States Steel Co., Pittsburgh. Mr. Brindle was previously general superintendent of Edgar Thomson Works, Braddock, Pa., and in that position will be succeeded by **James W. Kinnear, Jr.**

Frederick Nueske has been appointed master mechanic in charge of tooling, Daco Machine & Tool Co., Brooklyn, N. Y. He is the former owner of the Nueske Machine & Tool Co., Long Island City, N. Y.

John M. Henske has been named assistant superintendent of the magnesium department rolling mill, Dow Chemical Co., Midland, Mich. He has been with the company since 1948. **J. P. Doan** has been named superintendent of extrusion operation, magnesium department, Dow's Madison Div.

Hans A. Altorfer has been appointed chief engineer, Nordstrom Valve Div., Rockwell Mfg. Co., at Oakland, Calif. He was previously supervisor of the turbo-power development department, Allis-Chalmers Mfg. Co.

M. E. Peterson has been named general manager of the New Hamilton, Ohio plant of the Clearing Machine Corp., Chicago. Mr. Peterson has been with Clearing in various executive capacities since the company was formed in 1933.

Kenneth E. Reynolds has been named head of the defense contract department, Bausch & Lomb Optical Co., Rochester, N. Y. He has been associated with the firm since 1937.

S. A. Angotti has been appointed assistant secretary for the Landis Tool Co., Waynesboro, Pa. He was formerly director of industrial relations at Fairchild Aircraft Div., Hagerstown, Md.

Paul W. Arnold has been named executive assistant to the sales vice president, Reliance Electric & Engineering Co., Cleveland. **Richard A. Gueder** was named to head Reliance's applied engineering and industry sales dept.

George H. Johnson, President of the Gisholt Machine Company, Madison, Wisconsin, is shown congratulating new members of the 50 Year Club. Reading from left to right: **Al Tandvig,** Standards Dept.; **August Gerfen,** Engineering Dept.; and Mr. Johnson. Commemorative gold watches and diamond service pins were presented to both men

Harry W. Jobes has been appointed general manager of the Metal Products Div., United States Radiator Corp., Chicago Heights, Ill.

W. G. Scholl, general sales manager of the tractor division, Allis-Chalmers Mfg. Co., Milwaukee, was named a vice president of the company in charge of the sales for tractor division. Other vice presidents named by Allis-Chalmers include: **C. W. Schweers,** director of sales in the general machinery div.; **J. F. Roberts,** director of engineering in the general machinery div.; and **W. A. Yost,** manager of the mechanical power department.

Brig. Gen. Horace A. Shepard (USAF) has been named vice president, Thompson Products, Inc., Cleveland. He will be assistant to the general manager of the corporation. Gen. Shepard was formerly assistant deputy chief of staff for materiel in Washington.

Matthew J. Pastell, Jr., project engineer, Battery Div., P. R. Mallory & Co., Inc., N. Tarrytown, N. Y., has been called to active duty by the U. S. Navy. He has been assigned to the Civil Engineer Corps.

B. R. Teree has been appointed chief engineer of the Aviation Div., Weatherhead Co., Cleveland. He was formerly associated with the company, but most recently has been director of engineering, Hydraulic Div., N. Y. Air Brake Co., Watertown, N. Y.

C. L. Van Derau has been named general works manager in charge of both the Mansfield and Columbus, Ohio plants, Westinghouse Electric Corp. Other Westinghouse appointments at Columbus include: **E. L. Smith,** former purchasing agent, named works manager; **C. D. Heaton** named manager of manufacturing; and **John B. Roman** named works engineer.

Thomas Roy Jones, president of Daystrom, Inc., Elizabeth, N. J., has been named the 1951 winner of the Henry Laurence Gantt medal for "distinguished achievement in industrial management as a service to the community," by the American Society of Mechanical Engineers.

Alex L. Gresham has been appointed division metallurgist, American Steel & Wire Co., a U. S. Steel subsidiary, Cleveland. He has been with the firm since 1935.

A mobile chest X-ray unit is taking a 4-day "cruise" (Tuesday through Friday) in the plants of The Warner & Swasey Co., where approximately three thousand greater Clevelanders are at work on machines to help tool the defense production program. The mobile unit is rolling right on the production floors so that the anti-T.B. fight can be carried on with the least disruption of vital output

Norman T. Harrison has joined Jones & Lamson Co., Springfield, Vt., as controller.

Henry A. Sturm has been appointed assistant manager of the Boston branch, Crucible Steel Co. of America. He has been associated with Crucible since 1937.

Eads Johnson, Jr. has been appointed executive vice-president of the Southern Wheel Div., American Brake Shoe Co., New York. He was formerly assistant vice president.

A. F. Zamis has been appointed chief engineer, Illinois Tool Works, Chicago.

OBITUARIES

Joseph F. Buhr, 74, board chairman of Buhr Machine Tool Co., Ann Arbor, Mich., died Sept. 2. Mr. Buhr founded the company which bears his name in 1925. He was also president of Huron Gray Iron Foundry Co., and American Pattern & Foundry Co., of Ypsilanti, Mich., and the R. & B. Tool Co., of Saline, Mich.

Charles S. Amadon, 57, owner and general manager, Connecticut Broach & Machine Co., New London, Conn., died Aug. 25. He formed the company in 1920.

Harry W. Benton, 67, plant engineer, Pratt & Whitney and Chandler-Evans Div., Niles-Bement-Pond Co., W. Hartford, Conn., died Sept. 10. He had been with the company for 25 years.

William Gordon James, 61, manager of large-power transformer engineering, Transformer Div., Westinghouse Electric Corp., Sharon, Pa., died Aug. 10. He joined Westinghouse in 1920 as a design engineer.

William F. McCarthy

William F. McCarthy, 79, for many years manager of the Boston office and later general manager of Henry Prentiss & Co., Inc., died on September 15. He was one of the founders of the American Machine Tool Distributors' Association and was one of its early presidents. He was one of the most widely known and respected men in the machine tool industry. Under Mr. McCarthy's management, Henry Prentiss & Co., Inc., was one of the largest machine tool distributors in the East.

LIST OF EXHIBITORS

33rd NATIONAL METAL CONGRESS AND EXPOSITION

DETROIT, MICH., OCT. 13-19

A

A. & B. Centerless Grinding Co. A115
A. B. C. Die Casting Machine Co. G127
Acetogen Gas Co. A125
Acme Manufacturing Co., Inc. D103
Acme Steel Company C221
Acme Tool Company A205
Adamas Carbide Corp. H218
Air-Flow Compressor Co. H219
Ajax Electric Company, Inc. F421
Ajax Electrothermic Corp. F421
Ajax Engineering Corp. F421
Adjusta Equipment Co. H147
Aktiebolaget Kanthal G352
Allegheny Ludlum Steel Corp. G459
Allied Products Corp. F302
Allison Company H431
Alloy Eng. & Casting Co., Inc. B107
Alox Corporation C112
Alvey-Ferguson Co. H502
American Brakeblock Div. F339
American Brake Shoe Company F339
American Chain & Cable Co., Inc. A342
American Cyanamid Company G452
American Gas Association G160
American Gas Furnace Co. G154
American Machine & Metals, Inc. B246
AMERICAN MACHINIST G256
American Manganese Steel Div. F339
American Metal Market C110
American Metals Co., Ltd. G459
American Optical Company B128
American Platinum Works G240
American Pullmax Co., Inc. A249
American Silver Company, Inc. D129
American Society for Metals (Detroit Chapter) H420
American Society for Metals (National Office) H323
American Society of Tool Engineers H245
American Wheelabrator & Equip. Corp. F439
Ames Precision Machine Works A152
Amplex Manufacturing Co. G416
Anchor Drawn Steel Co. D345
Anderson Bros. Mfg. Co. H351
Anderson Oil Co., F. E. F255
Angier Corporation G139
Applied Research Laboratories G121
Arcos Corporation F457
Aronson Machine Co. C127
Ashdee Products, Inc. G361
Ashworth Bros., Inc. D140
Atlas Press Co. A241
Aurora Metal Company C215
Austenal Laboratories, Inc. B142
Automotive Industries A256
Avon Tube Division C237

B

Babcock & Wilcox Tube Co. F314
Baird Associates, Inc. H427
Bakelite Div. Union Carbide & Carbon Corp. F322
Baker & Co., Inc. A363
Baldwin-Lima-Hamilton Corp. D311
Banner Manufacturing Co. H302
Bausch & Lomb Optical Co. B102
Bell & Gossett Company A308
Bernard Welding Equip. Co. H220
Blakeslee & Co., G. S. A250
Boice-Crane Co. A141
Bowser, Inc. H416
Brainard Steel Company G151
Brown-Hutchinson Iron Works A149
Bruce Products Corporation H223
Bruning Co., Inc., Charles F426
Brush Development Company B147
Buck Tool Co. C224
Buehler, Limited B131
Bundy Tubing Company D202

C

Cadillac Stamping Co. H258
Cam Lok Division Empire Products, Inc. H520
Cambridge Wire Cloth Co. C111
Campbell Machine Div. American Chain & Cable Co. A342
Carboloy Dept.—General Electric Company F214
Casting Engineers, Inc. H324
Chicago Metal Hose Corp. C218
Chicago Rivet & Machine Co. G214
Chicago Tramrail Corp. H215
Chilton Co., Inc. A256 & A138
Chrysler Corporation G416
Cincinnati Milling Machine Co. G356
Cities Service Oil Company D210
Clark Instrument Co. B143
Climax Molybdenum Company D250
Clinton Machine Co.—Warner Div. H546
Coast Metals, Inc. H426
Coles Cranes, Inc. F307
Colonial Steel Division Vanadium-Alloys Steel Co. D345
Commander Manufacturing Co. A159
Commercial Shearing & Stamping Co. D321
Commercial Steel Treating Corp. D310
Composite Die Supply Company D112
Congress International des Fabrications Mecaniques H519
Connors & Davis Sales Corp. H423
Continental Industrial Engineers, Inc. H345
Continuous Metalcast Corp. G459
Crane Packing Company D242
Cro-plate Co., Inc. G122
Crucible Steel Co. of America G310

D

Dake Engine Company F416
Deepfreeze Distributing Corp. H254
Delaware Tool Steel Corp. C211
Delta Power Tool Div. A319
Detrex Corporation G351
Detroit Edison Company F461
Detroit Electric Furnace Div. A260
Detroit Stamping Co. H306
Detroit Testing Machine Co. B127
Diamond Iron Works, Inc. H236
Die Casting G440
Dietert Company, Harry W. B244
Distillation Products Industries Div. D236
Diversey Corporation G346
Diversified Metal Products Co. H224
DoAll Company H305 & H406
Dow Chemical Co. F222
Dow Furnace Co. A349
Drever Co. C229
Driver Co., Wilbur B. A305
du Pont de Nemours & Co., E. I. F356

E

East Shore Machine Co. H111
Eastman Kodak Co. D236
Eaton Manufacturing Co. H357
Eclipse Fuel Engineering Co. G162
Elastic Stop Nut Corp. of America D223
Eldorado Mining and Refining Ltd. H118
Electric Furnace Company F405
Electric Products Co. H202
Electro Arc Manufacturing Co. H508
Elgin National Watch Co. H235
Electro-Alloys Div. American Brake Shoe Co. F339
Elox Corporation G239
Empire Products, Inc. H520
Engelhard Industries A363 A301 G240
Engineering Castings Div. American Brake Shoe Co. F339
Engis Equipment Company B223
Ercona Corporation B243
Erico Products, Inc. H158
Eutectic Welding Alloys Corp. F403

F

Fahralloy Co. H151
Fawick Airflex Co., Inc. G251
Ferner, Co., R. Y. B218
Firth-Sterling Steel & Carbide Corp. G446
Fiske Brothers Refining Co. C232
Flow Industrial Publishing Co. G440
Freedom-Valvoline Oil Co. H244
Frontier Bronze Corporation B203

G

Galileo Corporation of America, Inc. B138
Gas Appliance Service, Inc. G518
Gehringer & Forsyth D140
General Alloys Company A336
General Aniline & Film Corp. G451
General Controls Co. G164
General Electric Company A102
General Electric X-Ray Corp. F250
General Plate Co. D109
Goodrich Co., B. F. C212
Gordon Co., Claud S. H352
Graham Manufacturing Corp. H257
Gray-Grimes Tool Co. H154
Gulf Oil Corporation D230

H

H. & H. Research Company A205
H. & H. Tube & Mfg. Co. D314
Hammond Machinery Builders, Inc. F211
Hanchett Magna-lock Corp. H120
Handy & Harman F315
Harnischfeger Corporation G415
Harper Electric Furnace Corp. C204
Harshaw Chemical Company A220
Haynes Stellite Co. F440
Heintz Manufacturing Co. A339
Heli-Coil Corporation A154
Heppenstall Co. C122
Hevi Duty Electric Co. D350
Higbie Manufacturing Co. C237
Hilger, Ltd., Adam B146
Hitchiner Manufacturing Co. H264
Hobart Brothers Co. D138
Holcroft & Company G245
Holden Co., A. F. F406
Hones, Inc., Charles A. G265
Hoskins Manufacturing Co. F217
Houghton & Company, E. F. F306
Howard Foundry Co. C138

I

Illinois Testing Laboratories, Inc. B224
Industrial Cable & Sling Co. H251
Industrial Gas Div. Liquid Carbonic Corp. D114
Industrial Heating—Industrial Publ. Co. C239
Industrial Heating Equipment Co. D320
Industrial Press H128
Industrial Publishing Co. G440
Institut Dr. Foerster B136

International Mechanical Engineering Congress H519
International Nickel Co., Inc. A328
Invincible Vacuum Cleaner Mfg. Co. H123
Ipsen Industries, Inc. F360
Iron Age A138

J

Janney Cylinder Company G315
Jarrell-Ash Company B111
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Johansson Gage Co., C. E. B226
Johnson & Son, Inc., S. C. G316
Jones Co., C. Walker A145

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Kalamazoo Tank & Silo Company F416
Kanthal Corp. G352
Kearney & Trecker Corp. A240
Kelite Products, Inc. H253
Kemp Manufacturing Co., C. M. G144
Kennametal, Inc. G252
Kentucky Agricultural & Industrial Development Board H155
Kerns Company, L. R. A119
Keuffel & Esser Co. H206
King, Andrew B122
Kold-Hold Mfg. Co. G345
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Kropp Forge Co. D222
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L

Laboratory Equipment Corp. B247
Lake Shore Engineering Co. B134
Lapeer Mfg. Co. H157
Last Word Sales Co. H154
Leeds & Northrup Company F351
Leitz, Inc., E. B211
Lepel High Frequency Laboratories Inc. G145
Lincoln Electric Co. F348
Lindberg Engineering Company F340
Liquid Carbonic Corp. D114
Livingstone Engineering Company B228
Loftus Engineering Corp. G125
Los Angeles Chamber of Commerce G215
Los Angeles Dept. of Water & Power G215
Lubriplate Division Fiske Bros. Refining Co. C232
Lynchburg Foundry Company D337

M

Machinery, Industrial Press H128
Magnaflux Corporation G339 & G230
Magnethermic Corporation G234
Magnetic Analysis Corp. B231
Mahr Manufacturing Co., Div. H236
Makepeace Co., D. E. A301
Manufacturers Processing Co. H110
Martindale Electric Co. C201
Marvin Machine Products, Inc. F416
May Fran Engineering H541
Master Builders Company C131
McGraw-Hill Publishing Co., Inc. G256
Mechanical Air Controls, Inc. H340
Mechanics Laundry Co. D303
Merrill Brothers C134
Metal Products Sales Co. H264
Metal Progress ASM National Office H323
Metal Removal Co. H126
Metals & Controls Corp. D109
Metals Finishing Corp. H526
Metals Review ASM National Office H323
Michiana Products Corp. A312
Michigan Bell Telephone Co. F401
Michigan Industrial Gas Corp. H210
Michigan Steel Casting Co. G409
Microcast Division Austenal Laboratories, Inc. B142
Miller & Taylor Tool Co. G456
Milne & Company, A. A356
Mir-O-Col Alloy Co., Inc. A316
Modernair Corporation H315
Morton Gregory Corp. G202
Mueller Brass Co. H241
Multifinish Manufacturing Co. H247

N

National Carbon Co. F440
National Cored Forgings Co., Inc. F254
National Cylinder Gas Co. G112
National Diamond Laboratory C210
National Industrial Publishing Co. C239
National Lead Company F449
National Radiator Co. H109
National Research Corporation A309
National Spectrographic Laboratories B146
National Time & Signal Corp. B238
National Torch Tip Co. H148
Nelson Stud Welding Div. G202
New Hermes Engraving Machine Corp. H108
New Jersey Zinc Company A162
Niagara Blower Co. G422
North American Philips Co., Inc. A220
Nox-Rust Chemical Corp. H417

O

O. T. U. A. Office Technique Pour L'Utilisation de L'Acier H521
Oakite Products, Inc. D309
Ohio Crankshaft Company G246
Ohio Overall Cleaning Co. D303
Olsen Testing Machine Co., Tinius D216
Opplem Co., Inc. B138
Osborn Manufacturing Co. D118
Ozalid Division G451

P

Pangborn Corporation G421
Park Chemical Co. F456
Parker Rust Proof Co. H339
Peabody Industries H214
Penton Publishing Company G340
Peters-Dalton Co. G355
Phillips Manufacturing Co. A355
Physicists Research Company D135
Pickers-X-Ray Corporation F411
Platecoil Division Kold-Hold Mfg. Co. G345
Powdered Metal Products Corp. of America A118
Power Ball Oil Co. A105
Precision Metalsmiths, Inc. B123
Precision Spring Corp. A214
Precision Welder & Machine Co. H364
Product Engineering McGraw-Hill Publishing Co. G256
Product Engineering & Mfg. Corp. H221
Production Machine Company F225
Pyrometer Instrument Co., Inc. B108

R

RCA Victor Division D324
RCS Tool Sales Corp. H316
Radio Corporation of America D324
Ransburg Electro-Coating Corp. G445
Rapids-Standard Co., Inc. H121
Raytheon Manufacturing Company A255
Ready Power Co. G131
Reeves Pulley Company A350
Reliance Electric & Engineering Co. A360
Rem-Cru Titanium Co., Inc. G310
Reynolds Metals Co. F325
Richard Brothers Div. Allied Products Company F302
Richards Co., J. A. H152
Riehle Testing Machines Division B246
Robotron Corporation H535
Rockwell Manufacturing Co. A319
Rolock, Inc. D140
Ross Operating Valve Co. B232

S

Safety Clothing & Equipment Co. G462
Sales Service Machine Tool Co. A219
Sand Machinery Co. G330
Schenck, Carl B218
Schrader's Son Division, A. G309
Sciaky Bros. Inc. G318
Scott & Son, Inc., C. U. H243
Scovill Manufacturing Co. G459
Seal-Peel, Inc. A320
Selas Corporation of America G148
Sentry Company A109
Service Diamond Tool Co. G117
Sheldon Machine Co., Inc. A155
Sherman & Co. D129
Sinclair Refining Co. H358
Smith Corp., A. D. H524
Smith Welding Equipment Corporation A208
Socony-Vacuum Oil Co., Inc. G221
Solventol Chemical Products Inc. A202
Sonoflux Corporation H146
Sparkler Mfg. Company A218
Special Libraries Association—Metals Section H424
Spencer Scientic Instruments B128
Spencer Turbine Co. G260
Sperry Corporation G109 & D115
Sperry Products, Inc. D115
Standard Alloy Co. D140
Standard American Engineering Company D110
Standard Diemakers Supplies H128
Standard Electrical Tool Co. G210
Standard Oil Co. (Indiana) D130
Standard Steel Treating Co. H139
Standard Tube Company A216
Starrett Co., L. S. C123
Steel, Penton Publishing Co. G340
Steel City Testing Machines, Inc. G220
Stevens, Inc., Frederick B. D330
Stokes Machine Co., F. J. A158
Stone Machinery Co., Inc. A359
Stuart Oil Co., Ltd., D. A. A266
Sub Zero Products Mfg. Div. Deepfreeze Distributing Corp. H254
Sunbeam Corporation F256
Surface Combustion Corporation F240
Syntron Company H135

T

Tagliabue Instruments Div. Weston Elec. Instrument Corp. B227
Tempil Corporation C117
Tennant Co., G. H. H530
Texas Company C103
Tin Research Institute, Inc. B236
Tincher Products Co. C228
Tinnerman Products, Inc. C207
Tocco Induction Heating Equip. Div. Ohio Crankshaft Co. G246
Tool Engineer Amer. Society of Tool Engineers H245
Tracerlab, Inc. B118
Trent Tube Co. G310
Trerice Co., H. O. B245
Tri-Clover Machine Co. H346

U

Uddeholm Company of America B116
Udylite Corp. D330
Union Carbide & Carbon Corp. F440
United Chromium, Inc. B132
U. S. Air Forces—Materials Research H136
U. S. Electrical Motors, Inc. D302
U. S. Gypsum Company H143
Universal Castings Corp. G115
Universal-Cyclops Steel Corp. F247
Univertical Machine Co. H348
Upton Electric Furnace Co. C102

V

Vanadium-Alloys Steel Company D345
Vapofier Corporation C109
Vickers, Inc. G109
Victor—Peninsular Div. Allied Products Company F302
Vlier Mfg. Co. E204

W

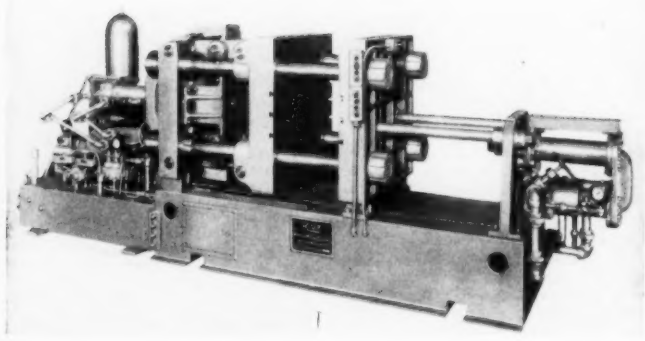
Walder-Scott, Inc. G101
Walker-Turner, Div. A240
Wall Colmonoy Corp. C243
Warner Division Clinton Machine Co. H546
Webber Appliance Co., Inc. H248
Weldit, Inc. H545
Wells Manufacturing Corp. D209
Wells & Sons, W. F. H117
Weltronic Company G224
Western Sealant of Detroit, Inc. C118
Westinghouse Electric Corp. G430
Weston Electrical Instrument Co. B227
Wheelco Instruments Company D219
Wilson Carbon Co. B220
Wilson Mechanical Instrument Div. American Chain & Cable Co. A342
World Raw Materials Congress H519
Worthington Pump & Machinery Co. G455
Wynn Oil Co. H124

Z

Zeiss, Inc., Carl Ercona Corporation B243

SHOW IN PRINT

Products shown in this section have not been described previously in our pages. They will be exhibited at the World Metallurgical Congress, Michigan State Fair Grounds, Detroit, October 14-19



Kux Hydraulic Die Caster is Automatically Timed, Controlled

The No. HP-37 die caster is hydraulic in operation and electrically controlled—movement of the pushbuttons puts the machine through its complete cycle with each phase automatically timed and controlled. Die space is 26½x20½ in. between tie bars, while die-locking pressure is 600 tons. Aluminum, brass, and magnesium die castings can be produced.

An injection-pressure multiplier boosts the pressure of metal injected to 25,000 psi. An accumulator unit with control valve permits any speed of injection desired.

The pressure multiplier automatically increases the pressure during the end of the plunger stroke. Timing can be adjusted by moving a limit switch on a track.

Timing of the die-plate movement is also adjustable. The die opening can be decreased from a maximum of 14½ in. for faster operating speeds when shallow castings are being made.

The hydraulic system is self-contained at the back of the machine with no obstructing walls to hinder required maintenance. A double-end motor operates two 1000-psi hydraulic pumps.

The ladling chamber is at the injection end of the machine at table height and there are no obstructing members around the chamber to hinder the operator.

Kux Machine Co., 3924 W. Harrison St., Chicago 24, Ill.

R.C.S. Portable Saw is Sealed Against Grease Leakage

A one-piece, heat-treated, alloy-steel piston with separate clamping jaw, hardened drive gears, insert piston bearings, a one-piece connecting rod with 30% more bearing area, and other improvements have been put in the Model-T Super Saw.

The entire unit is sealed against grease leakage and the grip has been improved.

The saw needs no starting hole and thus speeds up key-hole sawing. Held tightly against the material to be cut, with the guide used as a fulcrum, the tool is rocked into an upright position and then guided along the cutting line.

A blower keeps the saw cool and also blows chips away from the cutting line. Power is provided by any heavy-duty 1/4- or 5/16-in. electric drill, air drill, or by flexible shaft.

R. C. S. Tool Sales Corp., Joliet, Ill.

Leco Carbon Determinator

During the past few years there has been much interest in rapid and precise methods of carbon analysis of iron and steel of low carbon contents (below 0.10%). Low-carbon ferrochromium, stainless steel, high-silicon transformer steel, and ingot iron have been the principal types needing analyzing. While low-pressure methods are available for extremely precise measurement, they have the disadvantage of requiring complicated and expensive equipment and, in general, require 20-60 min for a single determination.

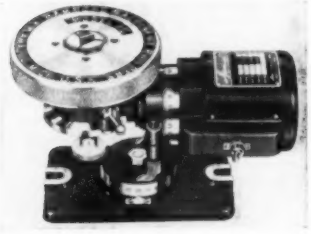
The Leco CD-10 carbon-determinator method require only 5-10 min. analysis time for most iron or steel, and the results compare favorably with the low-pressure method. The CD-10 has a range 0-0.035% carbon based on a 1-gram sample, and a sensitivity of about 0.0002%, depending upon the strength of the solu-

tion used. It is easy to operate and if simple precautions are observed, can be held in a stand-by condition for weeks.

Carbon content is found in the following manner: A sample is combusted in oxygen in a conventional resistance or high-frequency induction furnace, and the amount of carbon dioxide resulting is established by measuring the change in conductivity (reciprocal ohms) of a barium-hydroxide solution through which the CO-2 is passed.

The apparatus consists of a wheatstone bridge, a sulphur trap through which the products of combustion are passed, the barium-hydroxide measuring cell for the carbon dioxide and excess oxygen (changing one of the resistances on the bridge), and a cathode-ray tube. The change of resistance in the measuring cell is plotted against the known carbon content of the sample on a graph. The graph is a straight line over the range 0—0.035% carbon, and is then used in ascertaining the carbon content of unknown samples.

Laboratory Equipment Corp., St. Joseph, Mich.



Hammond Grinding Fixtures For Chip-Breaker Grooves

Solid-carbide-insert grinding fixture, Hammond model VC, is said to offer a faster, better, and more economical method of grinding chip-breaker grooves in round, square, triangular and rectangular shapes. It can also do rough or finish grinding of dull and damaged inserts.

The insert can be mounted on most tool and surface grinders. The motor is employed for sharpening all shapes, and for grinding chip breakers in round inserts. For grinding chip breakers in square, triangular, and rectangular shapes the motor is shut off and the spindle is indexed by hand with lock pin engaging index plate on underside of hand wheel for 2, 3, or 4 divisions. Collet spindle can be swiveled on horizontal axis 90° from vertical to right, and 45° to left when looking at motor end of fixture, and 360° on vertical axis. Lock pin handle when in lowest position locks spindle for changing or tightening collets. It is placed in neutral position for rotating collet spindle by motor or by hand, and upper position for indexing.

The unit is 7¼-in. high and 5¾-in. wide, it weighs 24 lb. The motor is totally-enclosed fan-cooled for 115 v, 1 phase, 60 or 50 cycles. The collet rpm is 180 on 60 cycles and 150 on 50 cycles.

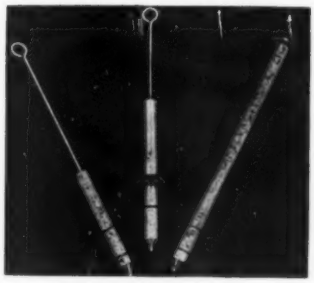
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo, Mich.

Metal-Marking Typewriter

This unit is especially valuable for the detailed marking of name plates.

Operation of the typewriter is simple. All controls are electrical—there is no need for a skilled operator. The letter wheel is made from alloy tool steel. As type sizes are interchangeable, any size wheel can be inserted quickly. The machine can mark up to ½-in.-thick steel.

Cadillac Stamp Co., 17315 Ryan Rd., Detroit 12, Mich.



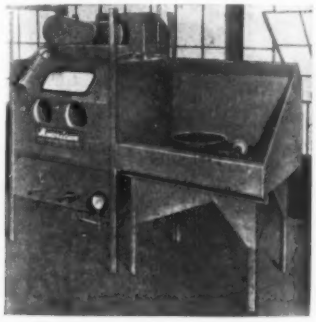
Tubular Multilift Magnetools

These hand operated load-releasing, tubular-Multilift Magnetools have been designed to remove boring chips from castings, chips from cutting machines, etc.

Models now available include both large and small magnets with hand wipe-off release or the mechanical pull-to-release. They are equipped with neoprene bumper rings to prevent the magnet grabbing sides and a brass pickup tip prevents sticking.

Magnetools are permanent and not electric, are resistant to water, oil, and gasoline. They are supplied in 5 models for varying job requirements and in 4 diameters; 1/16, ⅜, 1⅜, $2^{5}/_{8}$ in.

Multifinish Mfg. Co., Detroit 7, Mich.



Wet Blast Machine For Precision Cleaning

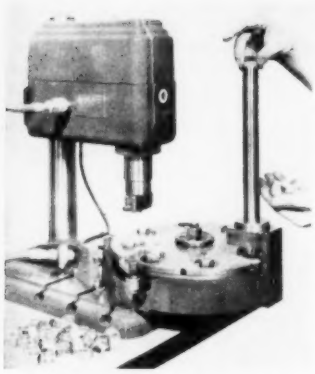
Called the Liquamatte, a wet blast machine available from American Wheelabrator & Equipment Corp., is said to have special features for improved operation and reduced maintenance.

A vertical pump is used for slurry recirculation, eliminating all suction piping, valves and fittings. It is always primed by floooded suction. Loss of slurry through leakage is eliminated because there are no packing glands. Abrasives can't plug the pump impeller when the machine is shut down and the hopper need not be drained before the pump is removed. Rubber hose instead of metal pipe is used wherever practical.

A reset timer is available for the unit which will tell at a glance the number of blasting hours the abrasive has been in the machine. When the abrasive does need changing, an air ejector (optional equipment) blows the slurry through hose to a sump pit or barrels.

The machine is intended to perform work for which dry blasting is too severe; namely, work with thin edges and sharp corners or work needing precision cleaning. The manufacturer can supply all abrasives and chemicals needed in the equipment. Abrasives sizes stocked range from 80 to 2500 mesh.

American Wheelabrator & Equipment Corp., Mishawaka, Ind.



15,000 Parts Produced per hr On Automatic Marking Machine

This is an air-operated machine called the Automark especially adapted to light, flat marking. The illustration shows a dial-feed fixture which makes possible the marking of brass nuts at a rate of 3000 per hr. Other parts can be marked at up to 15,000 per hr.

The machine can also be adapted to high-speed color marking by the branding method. It has automatic controls and is well guarded.

The unit operates from ordinary 110-v light sockets. It produces up to 900-lb impact pressure from 100-lb airline.

Cadillac Stamp Co., 17315 Ryan Rd., Detroit 12, Mich.

Desk-Model Copying Machine Reproduces In Seconds

Called the Ozamatic, the machine can make in one hour up to 1000 copies of different originals. Copies can be up to 16-in. wide, any length. A letter-size copy costs about 1½ cents, including operating costs and machine depreciation.

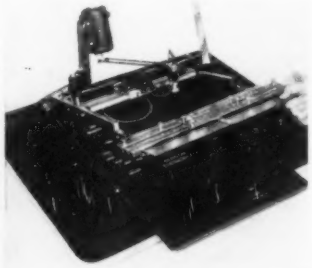
The Ozamatic will reproduce in seconds a photo-exact copy of any translucent invoice, letter, or record—often improving on the legibility of the original. Two or more complicated reports can be combined on one sheet of paper in minutes. Variable data can be added or deleted from a constant form, and a reprint made of just the information required.

Printing and developing speeds are synchronized up to 30 ft per min. The light source is a 1200-watt mercury-vapor quartz lamp. Transformer is a constant-wattage stabilizer which maintains constant printing speeds by controlling voltage fluctuations within the 105—125-v range. Electrical consumption is 20 amps at 110-v ac, 60 cycles. The machine is powered by a dc motor operating from a half-wave electronic-drive panel, permitting instantaneous speed changes.

The developer system is brought to correct operating temperature in just a few minutes by a thermostat-heat control. A manually adjustable, single-feed regulator starts, stops, and controls the gravity-fed ammonia flow. Twin blowers remove all heat and vapors.

Unit height is 27 in., width is 28½ in., and depth 35½ in. Weight is 355 lb.

Ozalid, Div. of General Analine & Film Corp., Johnson City, N. Y.

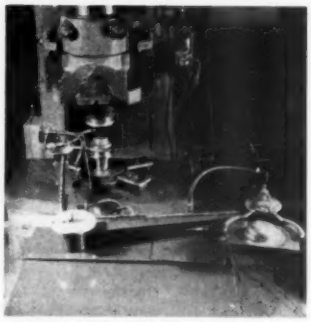


Machine Engraves 15 Sizes From One Templet

An enlarged-capacity engraving machine is capable of engraving on units up to 25 in. wide and to any length. It is said to be ideally suited for engraving names, numbers, etc. on dials, nameplates, and panels covering from the smallest area up to extra-large dimensions, on either metal or plastic.

The Engravograph works on the pantograph principle and is the only portable machine which can engrave 15 different sizes from one templet. It can also do multiline engraving in one setup using adjustable copy-holding slides.

New Hermes, Inc. New York 3, N. Y.



Automatic Press Feeder Eliminates Hand Loading

With the Lodac Feeder, mechanical fingers pick up parts after first draw and feed one or more consecutive re-draw presses at speeds up to 1200 parts per hr. Similar fingers remove the parts from the press and transfer them to a conveyor for further press operations.

The complete operation cycle is set by the speed adjustment of the press feeder. At the proper point after loading, the press is tripped by the feeder, either pneumatically or electrically. If the part is not removed from the die, a safety circuit stops feeder and press. However, if parts are not being loaded to the die, a memory circuit will continue to operate the press and feeder avoiding shutdowns. After any shutdown, the memory circuit starts the feeder and press at the point of the cycle where it was last interrupted.

The mechanical fingers are specially designed for parts to be handled, and are held in special chucks for quick change between press runs.

Magnaflux Corp., 5900 Northwest Highway, Chicago 31, Ill.

Friction-Proofing Additive Aids In Machining

Power-Ball, Friction-Proof Oil is an additive for use with coolant, lubricant, drawing compound, and hydraulic fluids as an aid in machining operations.

It is said to be non-corrosive and will function in a temperature range of −60 to 640 F. It reduces friction and cuts power costs. Oil viscosity is not reduced appreciably.

Power-Ball is non-toxic and non-explosive. Applications include industrial machinery, diesel engines, construction equipment, etc. It is available in pints, gallon cans, five-gallon cans, and 54-gallon drums.

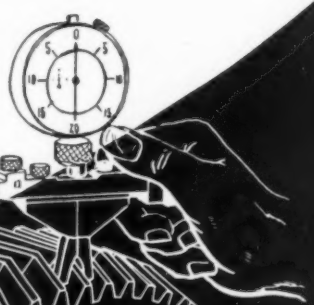
Power Ball of Michigan, 8125 E. Jefferson, Detroit 7, Michigan

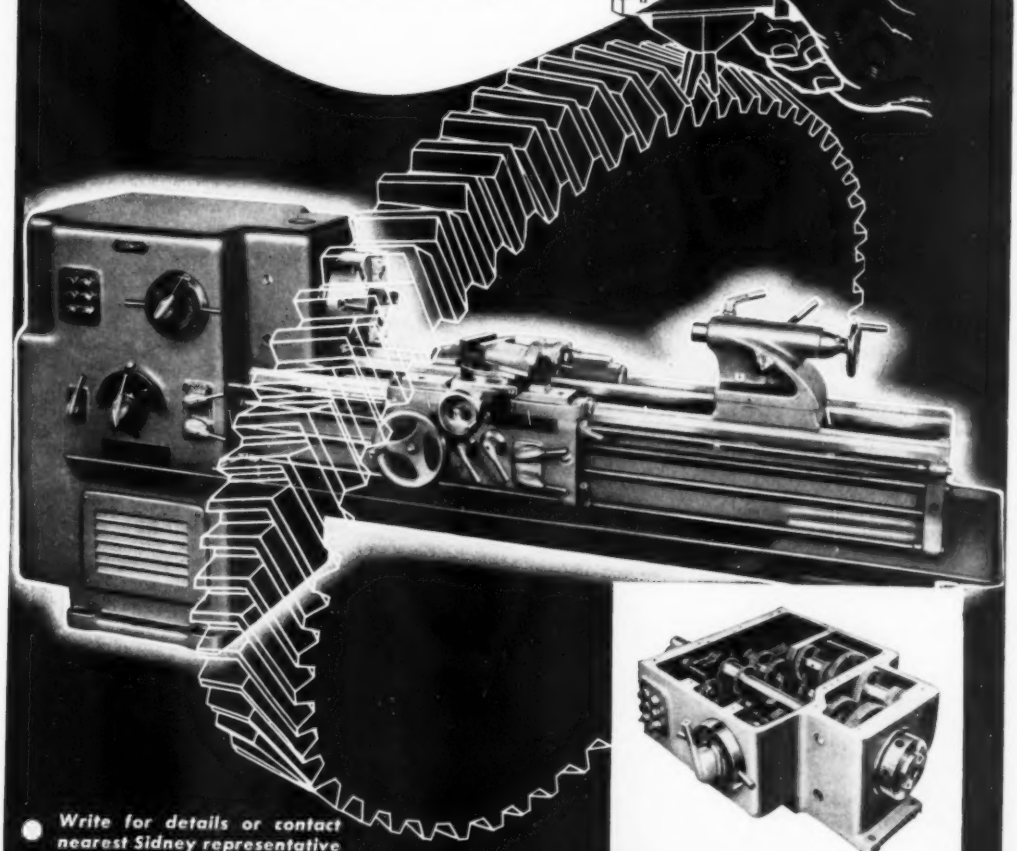
rely safely on Sidney Herringbone Gears

FOR TOOTH-TO-TOOTH ACCURACY

SUPERIORITY is achieved by extreme accuracy, more tooth contact resulting in greater strength and smoother action, with end thrust eliminated through the double opposed helix angles.

ACCURATE TOOTH CONTOUR, gradual engagement and oblique lines of contact assure correct tooth action and KEEP WEAR TO A MINIMUM. Especially suited for carbide cutting tools.

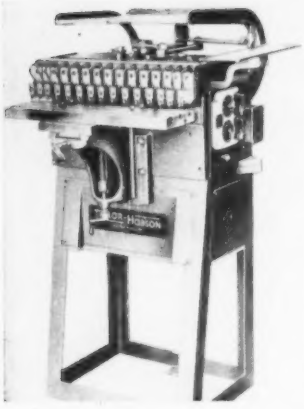




Write for details or contact nearest Sidney representative

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

BUILDERS OF PRECISION MACHINERY SINCE 1904



Javelin Etcher Marks 15 Pieces At One Time

This machine handles up to 15 workpieces at one time; etching on hard or soft metals, flat or curved surfaces, with identifying numbers, names, trademarks, or designs.

Marking is produced by means of a series of minute electric arcs, formed at the point of a rapidly vibrating electrode linked to a pantograph. The pantograph, which controls the javelins, is guided in specially prepared intaglio copy, by a single operator who can be relatively unskilled.

The javelin method is said to offer maximum flexibility for shape and size of workpiece and for design and depth of mark. A piece may be etched in its finished state without prior or after-treatment. The work is clean, accurate, safe, leaves no burrs, and will not damage or weaken the product. Production is faster and cost is lower than conventional marking or acid etching.

Engis Equipment Co., 431 S. Dearborn St., Chicago, Ill.

Small Lot Tumbling Machine Uses Interchangeable Barrels

A tumbling machine with twin barrels mounted at each end of a common drive shaft is available with three interchangeable drum sizes. Each drum has a chute, through front of cabinet, for discharge of load into tote pan or screen.

The drums are made of ¼-in. steel plate, enclosed in a cabinet 54 in. high at back, with opening slanting forward for ease in loading. Capacities of the drums are: 0.4, 2.0, 3.3 cu ft.

Variable speed of the machine is 20 to 45 rpm, working off a ¾-hp, 3-phase, totally enclosed motor. Step-cone pulley speeds are 18, 24, and 36 rpm. The machine uses only 34 x 46 in. of floor space.

The machine is said to have received wide public acceptance in applications of small lot deburring and tumbling.

Metals Finishing Corp., 836 E. 10 Mile Rd., Hazel Park, Mich.

Leco Induction Furnace for Burning Steel Samples

This furnace is used to burn iron and steel samples for combustion carbon analysis. It actually jets the oxygen into the sample where it is immediately consumed, thus assuring instantaneous starting of combustion and complete burning of the sample.

The over-all result is to eliminate sample preheating, to combust the sample in a minimum amount of oxygen, and to make full use of the exothermic reaction between iron and oxygen. Without the jet combustion tube a considerably larger power input would be required to provide the same rapidity and intensity of heating.

The furnace draws 0.012 kva for the fraction of a minute that is actually required to combust a sample. Stand-by power is 0.002 kva.

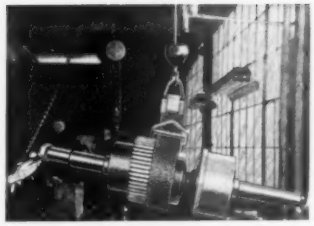
The furnace is ready for use only 45 sec after the circuit is closed and is available for instant use from thereon. As there is no insulating refractory requiring hours to bring to operating temperature, the furnace is particularly recommended for intermittent and stand-by operation.

Temperatures are in excess of 3000 F, which makes all steel, low-carbon, high-alloy, stainless, and ferro-alloys amenable to rapid and complete combustion. Even tungsten-carbide and jet-alloy samples are burned successfully with the Leco 1H-10 unit.

Laboratory Equipment Corp., St. Joseph, Mich.

Pyromark, a high-temperature paint, has excellent refractory properties, and can be applied like ordinary paint by brushing or spraying. It dries quickly to a firm coat with good adherence. It will survive temperatures above 2500 F, provided that the surface to which it is applied will not of itself, scale off. The paint is available in green, maroon, blue, white, black, or gray at $40.00 per gallon.

Tempil Corp., 132 W. 22nd St., New York 11, N. Y.



Cambridge Gripper Sling Provides Load Stability

The Gripper Sling, a materials-handling tool, consists of a series of spiral wires joined together across the body of the sling as in a woven wire conveyor belt.

Heat-treated steel handles are welded to each end of the sling and are designed so that one set of handles can be used for either a basket or choke hitch. The bearing surface of the sling is broad and flat and bends across its width, rather than along its length.

The sling is said to provide greater gripping power around the load and better load stability.

Cambridge Wire Cloth Co., 940 Washington Blvd., Cambridge, Md.

Silver-Clad Steel Strip Substitutes for Brass

A laminated strip product consisting of a solid sheet of silver (not an electroplating), clad on either one or both sides of a core of mild steel, has been developed as a substitute for restricted metals.

It is available in widths up to 4 in., in thicknesses down to 0.005 in., and in any required temper. It is being manufactured in various silver-to-steel thickness ratios and rolled or slit to order. The strip is produced with a high, as-rolled luster requiring practically no polishing, and can, if desired, be electroplated directly with gold or other non-restricted metals.

It can be shaped by stamping, bending, drawing, spinning, and other processes, and component parts can be assembled by silver brazing or soft soldering. It may be used as a substitute for brass, nickel-silver, and other restricted metals.

The product has excellent thermal and electrical conductivities and high resistance to alkalies and organic acids and is said to have wide industrial applications, from aircraft bearing and electrical contacts to chemical equipment.

Roller Plate Div., American Silver Co., Flushing, N. Y.

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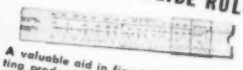
for prompt help with your production drilling problems

When you need facts and figures *fast*—when it's a case of cost of equipment estimates, specifications, production data or recommended methods and machines for an important contract bid or to solve an urgent production drilling problem . . . take advantage of Leland-Gifford's seven convenient offices. Strategically located in the heart of the Nation's metal-working centers, one of these offices is sure to put Leland-Gifford as near to you as your telephone. Expertly staffed, eager to help you, our nearby district office is prepared to give you "home office" service while saving your valuable time.

SAVE DAYS!

CONTACT THE OFFICE NEAR YOU!

FREE — WRITE FOR THIS PRODUCTION SLIDE RULE



A valuable aid in figuring costs and setting production schedules. Quickly gives time required to drill holes of any size and depth in any material. It's free. Write the nearest office.

LELAND-GIFFORD
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

Electric Arc Used To Remove Broken Taps

The M-7 Tapmaster employs an "electrode"—a hollow copper alloy tubing available in various diameters — which is chucked into the disintegrating head and held firmly by a collet. In removing a broken tap or drill, an electrode about half the diameter of the broken tool is used, and the head lowered so the electrode is centered about ¼ in. above the tap. As the head is fed downward, in the same manner as a drill press, a series of electric arcs cut down between the core and threads of the tap without damage to the threads.

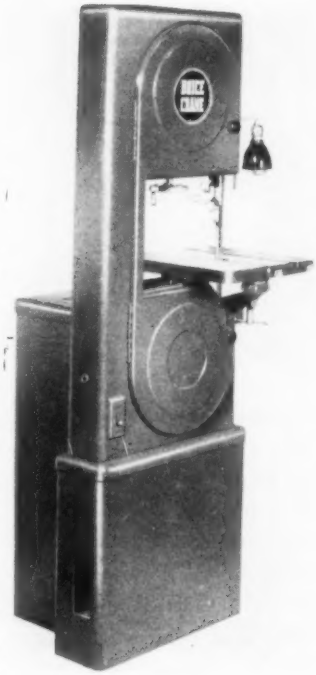
A coolant pumped through the hollow electrode washes away particles of metal. In a through hole the core can be knocked out as soon as the electrode has cut its way through. In a blind hole the core is picked out with a magnetized pick or tweezers. Once the core is removed the remaining threads are picked out easily. The same method is used on broken drills.

The Tapmaster allows 28 in. of worktable clearance and the adjustable drillhead may be reversed to give 5-ft of work clearance from the floor. A back break adjusts for corner drilling and drilling holes at any angle up to 45°.

It will cut and counterbore any type of steel regardless of hardness, shape or size. The electrode is used to cut or enlarge keyway slots in cutters, dies, etc., and to repair or alter molds and dies. Its accuracy makes it possible to drill holes from 0.040 to 1 in. and larger in hardened dies within 0.010 in. It will cut and counter-bore cemented carbide and since the electrode does not revolve but only vibrates vertically, any odd shaped hole, such as square, hexagon, etc., can be drilled.

A complete, self-contained unit, the Tapmaster has a 3-kva rating using current at approximately the same rate as an electric toaster. The electrodes are inexpensive, costing less than 10¢ per in.

Elox Corp. of Mich., 740 N. Rochester Rd., Clawson, Mich.

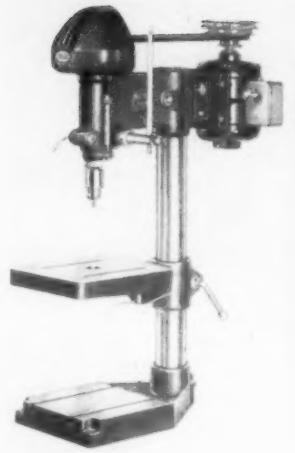


Boice-Crane Bandsaw Has Eight Speeds

A 14-in. basic bandsaw model can be equipped for contour-sawing of metals and non-metals, continuous band-filing contour work, and for abrasive-band finishing.

It is said to be readily available from distributor's stocks in industrial areas.

Boice-Crane Co., 930 W. Central Ave., Toledo 6, Ohio



Two B-C Drillpresses Available in 100 Styles

A standard ⅝-in. model and a new ½-in. model made by Boice-Crane can be ordered with choice of over 100 different speed, equipment, and mounting options. Floor and bench types are available, speed ranges can be high or low, various spindles and work arbors can be obtained, and models with up to four spindles can be supplied. Components which build into special tooling are also available with the drills. Maximum work height of these machines is 15 in.

The models are readily available from distributors' stock in industrial areas.

Boice-Crane Co., 930 W. Central Ave., Toledo 6, Ohio

Scottsonizing Steel Treatment For Hard, Chromelike Finish

C. U. Scott & Son claim that they can take most any of the standard SAE grades of machine steels which have a bright polish, give the part a very hard case and still retain the polished finish. The case is claimed to withstand a 48-hr salt spray.

Two distinct new treatments have been added to Super Scottsonizing. One is known as jet gray, giving the parts a silver color which is claimed to become a part of the steel itself. The other is jet black. These treatments are said to add to the appearance of the parts as well as improve the non-corrosive and wearing qualities.

C. U. Scott & Son, Inc., 1510 First Ave., Rock Island, Ill.

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FOR YOUR INFORMATION

***FREE** Catalogs, Booklets, Charts, Calculators*

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MACHINES AND ATTACHMENTS

1 GRINDING MACHINES—*Mattison Machine Works, Rockford, Ill.* 20-page illustrated catalog giving machine data and descriptions of various surface, face, and disc grinders.

2 ABRASIVE-BELT MACHINES — *Porter-Cable Machine Co., Syracuse 8, N. Y.* 28-page illustrated manual of applications, specifications, etc. on line of abrasive-belt machines.

3 BORING MILLS—*The Portage Machine Co., Akron, Ohio.* 12-page illustrated catalog on horizontal boring, drilling, and milling machines. Includes construction and operating details, and description of attachments.

4 GEAR CHECKER—*National Broach & Machine Co., Detroit 13, Mich.* 16-page illustrated bulletin of descriptive data and operating procedures on various Universal Gear Checkers and attachments.

5 TEMPLET DRILLING — *Wales-Strippit Corp., No. Tonawanda, N.Y.* 8-page illustrated brochure on Wales Drilling Machine for templet layout, drilling, and reaming of holes. Describes method, equipment, and accessories.

6 AUTOMATIC THREADER — *Carl Hirschmann Co., Manhasset, N. Y.* Illustrated specification sheets on automatic-tapping and threading machine imported from Germany.

7 HYDRAULIC DUPLICATOR—*Turchan Follower Machine Co., Detroit 4, Mich.* 12-page illustrated catalog of applications and descriptions of various Turchan Followers.

8 SAFETY ATTACHMENTS — *Morrison Products Inc., Cleveland, Ohio.* 4-page illustrated brochure of wheel guards used on portable grinders.

9 UTILITY PRESSES — *Colonial Broach Co., Detroit 12, Mich.* 4-page technical bulletin on line of 4- to 10-ton presses. Includes descriptions, capacities, and installation data.

10 PRESS ATTACHMENTS—*U. S. Tool Co., Ampere, N. J.* Illustrated catalog describing automatic-press room equipment for use with punch presses.

11 MACHINE HANDLES — *Tomco Products Co., Racine, Wis.* 4-page illustrated brochure of standard machine handles, knobs, and specialties.

TOOLS AND ACCESSORIES

12 END MILLS—*Putnam Tool Co., Detroit 7, Mich.* 108-page illustrated catalog, listing over 1000 standard types and sizes of end mills. Use company letterhead.

13 TAPS— *DoAll Co., Des Plaines, Ill.* 16-page illustrated catalog of DoAll taps. Includes specifications, technical data, prices, and suggestions for ordering.

14 JIG BUSHINGS—*Ace Drill Bushing Co., Los Angeles 29, Calif.* 8-page reference handbook of comparison tables for ordering drill jig bushings. Includes cross index of 3023 manufacturers symbols.

15 CARBIDE TOOL TIPS—*Adamas Carbide Corp., Harrison, N. J.* 20-page illustrated catalog of techniques and specifications on line of tungsten-carbide tool tips, dies, and wear parts.

16 ELECTRIC TOOLS—*Stanley Electric Tools, New Britain, Conn.* 96-page illustrated catalog of descriptive information on complete line of portable-electric tools for working in metal or wood.

17 COMPARATOR GAGES — *Moore Products Co., Philadelphia 24 Pa.* 24-page illustrated booklet describing and giving operating data on line of pneumatic-comparator gages.

18 MEASURING INSTRUMENTS — *Tubular Micrometer Co., St. James, Minn.* Illustrated catalog describing line of micrometers, gages, dial indicators, standards, calipers, etc.

19 REAMERS—*DoAll Co., Des Plaines, Ill.* 12-page illustrated brochure on DoAll line of precision reamers. Includes detailed listings, specifications, and prices. New diemakers reamers are cataloged.

20 CUTTING OIL—*Fiske Bros. Refining Co., Newark 5, N. J.* Data sheet on CSA No. 2, cutting oil for aluminum and all-aluminum alloys. Includes applications, general recommendations for both oil and paste.

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Company .....
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AMERICAN MACHINIST, New York — Not good after — Dec. 1, 1951

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21 OIL ADDITIVE—*Power-Ball Oil Co., Inc., Columbia, S. C.* Package unit of descriptive literature on Power Ball, a friction-proofing additive. Includes applications, technical data, and test cases.

22 TUBE JOINERS—*Vogel Tool & Die Corp., Melrose Park, Ill.* 6-page pamphlet on Arc-Fit line of pipe and tube-joining equipment. Includes descriptions, applications, and prices.

HEAT-TREATING AND WELDING

23 FUSION WELDING—*International Nickel Co., New York 5, N. Y.* 44-page illustrated technical bulletin on fusion welding of nickel and high-nickel alloys. Contains specifications, data sheets, tables, and welding techniques.

24 HEAT-TREATING FURNACES — *Surface Combustion Corp., Toledo 1, Ohio.* Illustrated brochure describing fuel-fired batch and continuous furnaces used in small-caliber ammunition production.

25 ALUMINUM SPOT WELDING — *Oakite Products, Inc., New York 6, N. Y.* 17-page illustrated booklet on preparing aluminum for spot welding. Contains immersion tables and tips on cleaning aids.

26 SPRAYWELDER — *Wall Colmonoy Corp., Detroit 3, Mich.* Illustrated data file on model B, Spraywelder, a powder-metallizing unit.

PLANT-SERVICE EQUIPMENT

27 RESISTANCE WELDING—*International Nickel Co., New York 5, N. Y.* 30-page illustrated technical bulletin on resistance welding of nickel and high-nickel alloys. Contains data sheets and welding information.

28 CONVEYOR IDLERS—*Chain Belt Co., Milwaukee 4, Wis.* 42-page illustrated handbook on belt-conveyor idlers and machinery. Contains technical data, applications, and description of equipment.

29 VIBRATION REDUCTION—*American Felt Co., Glenville, Conn.* 18-page illustrated booklet on Vibra-mount Felt, a cushioning material on which to mount machinery.

30 TRUCK MAINTENANCE — *Baker Industrial Truck Div., Baker-Raulang Co., Cleveland 2, Ohio.* 16-page illustrated bulletin on care of industrial trucks through preventive maintenance. Uses 51 pictures to show steps to be taken in annual check-up.

31 HYDRAULIC-LIFT TRUCKS—*Barrett-Cravens Co., Chicago 9, Ill.* 16-page illustrated bulletin on two new hydraulic-lift trucks, developed for one-man handling of heavy pallet loads.

32 OPEN-STEEL FLOORING — *Open Steel Flooring Institute, Inc., Pittsburg, Pa.* 16-page illustrated booklet on uses of steel grating as floors, walkways, platforms, etc.

33 VAPOR DEGREASERS — *Phillips Mfg. Co., Chicago 45, Ill.* 12-page illustrated bulletin on a line of degreasing equipment. Contains technical data, capacities, and uses of each model.

34 PACKAGING GUIDE — *Mehl Mfg. Co., Cincinnati 2, Ohio.* 36-page illustrated pocket-size handbook outlines government packaging specifications. Military specs. are cross-indexed. Methods and materials are covered.

35 METAL CLEANING—*Oakite Products, Inc., New York 6, N. Y.* 48-page illustrated booklet on materials, methods, and equipment for handling metal cleaning in the aircraft industry.

36 ELECTRONIC-PAINT SPRAY — *Ashdee Products, Inc., Homewood, Ill.* Illustrated folder on Paint-Miser, an electronic paint-spraying machine. Covers procedures, capacities, and construction.

37 EXTINGUISHER GUIDE — *Randolph Labs., Inc., Chicago, Ill.* Poster (12 x 22 in.) in two colors for use in plants as a guide to the proper use of fire extinguishers.

PARTS AND MATERIALS

38 SPEED REDUCERS—*Abart Gear & Machine Co., Chicago 50, Ill.* 96-page handbook of speed reducers and right-angle gear motors. Gives engineering data, fit requirements, hp ratings, ratios, and installation graphs.

39 SCREW PRODUCTS — *Holo-Krome Screw Corp., Hartford 10, Conn.* 28-page illustrated catalog on socket-screw products and button-head socket-cap screws. Includes engineering data.

40 ELECTRICAL STEELS — *Armco Steel Corp., Middletown, Ohio.* 32-page illustrated booklet on thin-electrical steels. Complete data is given for design purposes.

41 BARREL-FINISHING — *Norton Co., Worcester, Mass.* 56-page illustrated handbook on barrel-finishing with Alundum tumbling abrasive. Contains descriptions, procedures, and practical hints.

42 WORM-GEAR DRIVES — *Cleveland Worm & Gear Co., Cleveland 4, Ohio.* 8-page illustrated folder on construction and applications of worm-gear speed reducers.

43 POWER UNITS—*Haskel Engineering & Supply Co., Glendale 4, Calif.* 12-page illustrated bulletin describes line of hydraulic-power units and well-mounted motor-pump units. Lists 312 models.

44 TUBULAR PARTS—*Tube Bends, Inc., New Britain, Conn.* 8-page illustrated brochure on facilities for the manufacture of specialized tubular parts for the aircraft industry.

45 CORROSION CHART—*Alloy Tube Div., Carpenter Steel Co., Union, N.J.* 12 x 9-in. chart for plant or office giving corrosion-resistance information of stainless-steel tubing and pipe.

46 MERCURY SWITCHES — *Micro Switch Div., Minneapolis-Honeywell Regulator Co., Freeport, Ill.* 5-page catalog on Honeywell mercury switches. Gives selection and application aids, and ac and dc ratings and data.

47 INDUCTION MOTORS—*Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.* 6-page illustrated folder on construction and applications of large squirrel-cage induction motors.

48 AIR CYLINDERS—*Rivett Lathe & Grinder, Inc., Brighton 35, Mass.* 12-page illustrated catalog listing 28 models of air cylinders. Working drawings and specifications are included.

49 DIE-PRESSED FORGINGS — *Anaconda Copper Mining Co., New York 4, N. Y.* 12-page illustrated booklet of reference data on copper and copper-alloy die-pressed forgings.

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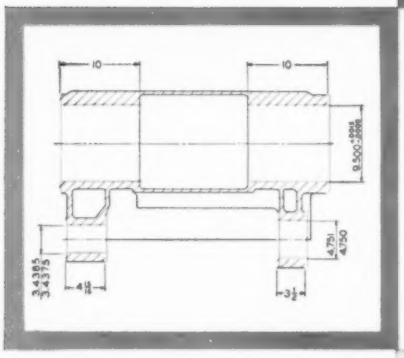
the jigmil technique *solves the problem*

of small lot production at The Oster Mfg. Company Cleveland, Ohio

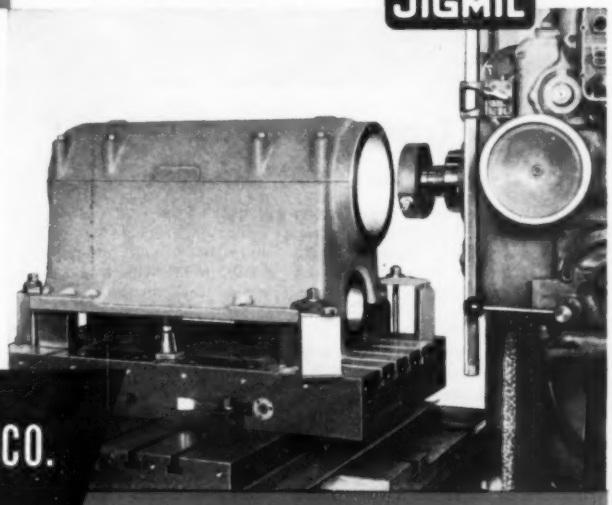


MACHINE—Model 3-B JIGMIL
PART—Spindle Head—Pipe Threading Machine
MATERIAL—Cast Iron

Sequence of Operations—With part mounted on standard JIGMIL Index Table,

1. Rough bore 9.500" diameter and face boss.
2. Finish bore 9.500" diameter and chamfer boss.
3. Rough and finish bore 4.750" diameter.
4. Index 180°.
5. Rough and finish bore 3.438" diameter.
6. Rough bore 9.500" diameter and face boss.
7. Finish bore 9.500" diameter and chamfer boss.

DEVLIEG JIGMIL



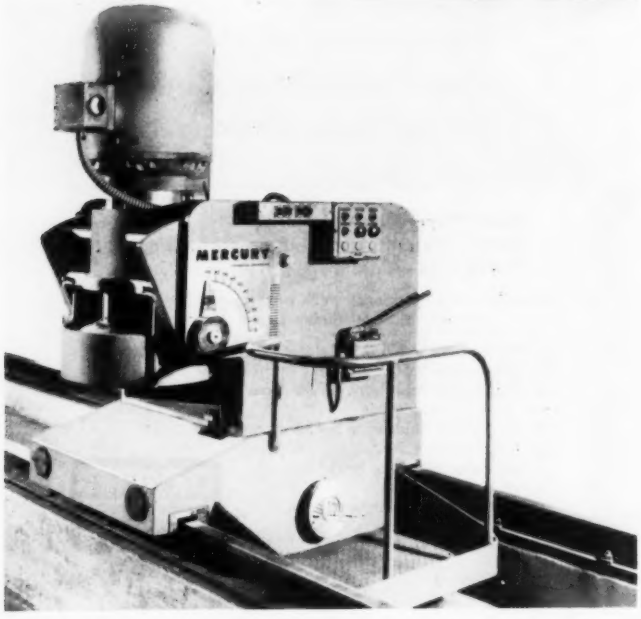
"IN LINE" bores are machined to Precise Limits of Alignment by means of the JIGMIL INDEXING PRINCIPLE.

- **All machining operations performed at one set up of workpiece.**
- **No Costly Line Boring Bars.**
- **No Boring Jigs.**
- ***Fast Production and High Accuracy.***
- ***Substantial Reduction in Assembly Costs.***

DEVLIEG MACHINE CO.

450 FAIR AVE., DETROIT 20, MICHIGAN

New Shop Equipment Materials and Parts



Mercury Traveling-Head Grinder Eliminates Traverse Bed

The E-20 grinder can grind edges, angular surfaces, compounds, bevels, and machine pads on heavy castings 20 ft and longer. It eliminates the expensive and hard-to-maintain traverse bed found on most traveling-head grinders.

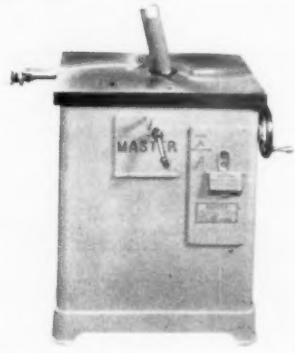
The grinder runs on self-powered rollers along rails machined to tolerance and equipped with built-in leveling devices. The 20-in. face-grinding wheel is mounted on a head which tilts from horizontal to full vertical. Head traverse rate is continuously variable. Two or more grinders can operate on a single set of rails. The concrete-mounted rails are kept clean by wipers.

The motor-and-spindle assembly is mounted within rigid trunnions. Feed is through a 7-in. range, using a planetary-gear-driven motor reducer in combination with a precision lead-screw. Increments of feed are electrically controlled.

Machine Tool Div., Mercury Engineering Corp., 2100 N. Farwell Ave., Milwaukee 2, Wis.

The Custanite Spring-Flo Safety Hammer is made of a specially-developed alloy said to have a high degree of tensility. The hammer contains a hardened high-carbon ribbon-steel spring at either end of the head resulting in a controlled flow of metal in the hammer head despite heavy use. It will not chip, spark, or mushroom and retains its original weight and balance. Available in six sizes from ¾ to 6 lb.

Charles Budd Corp., New Rochelle, N. Y.



Spindle Sander and Grinder Has Oscillating, Tilting Spindle

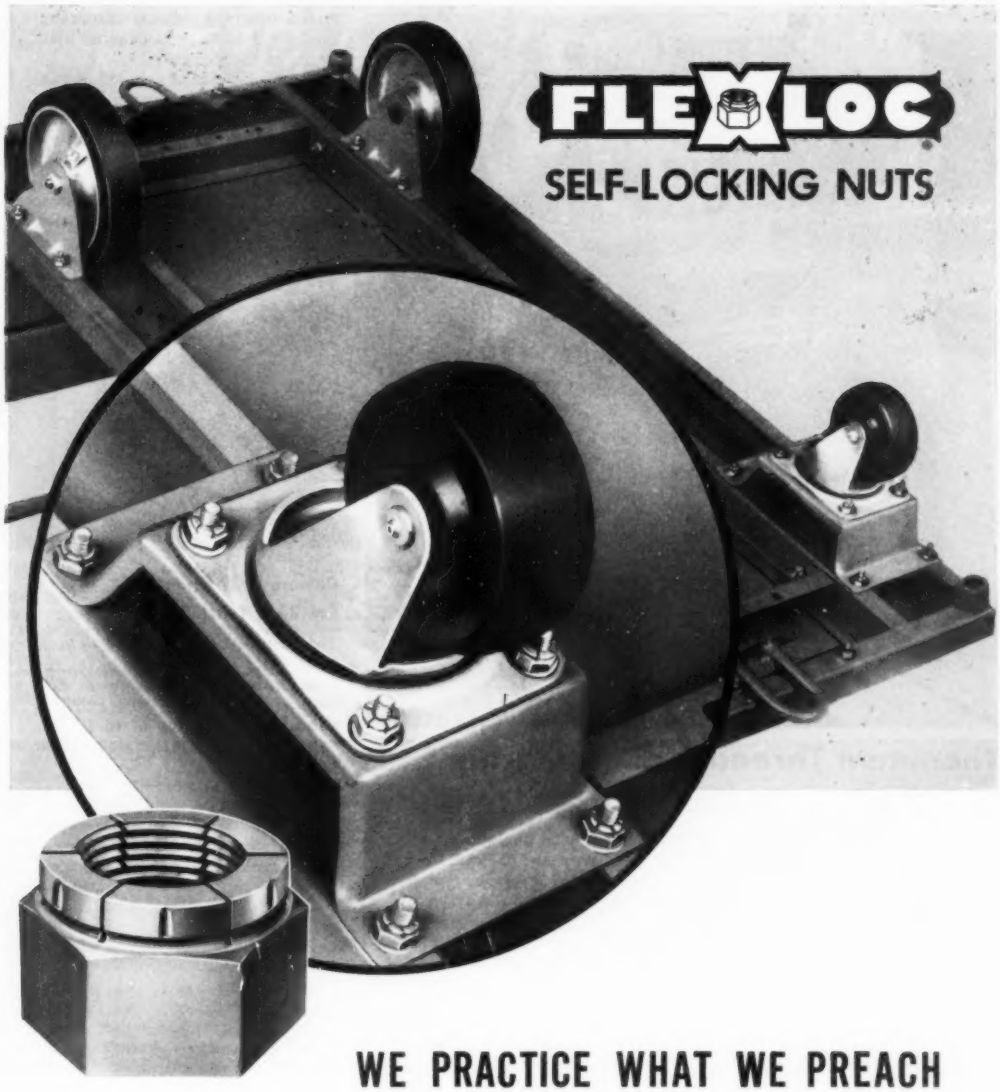
This is claimed to be the only unit of its type employing a tilting spindle rather than a tilting table—the work is always in a horizontal position. The spindle can be used oscillating or non-oscillating, can be tilted from 0° to 45° by a worm and gear, and can be locked in any position.

Another feature is the core-box attachment, which produces straight and tapered coreboxes mechanically, eliminating tedious handwork.

Other features include a lighted periscope for easy reading of settings; a 2-hp, constant-hp motor—with choice of 2000- and 4000-rpm speeds; adaptability of abrasive sleeves from ¼ to 4 in. in dia; and 6 to 11 in. in length; also grinding wheels up to 5 in. in dia and 5 in. high. A built-in safety device prevents use of the high speed with large-dia work.

The machine can be used on wood, metal, and plastics.

Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, Ohio

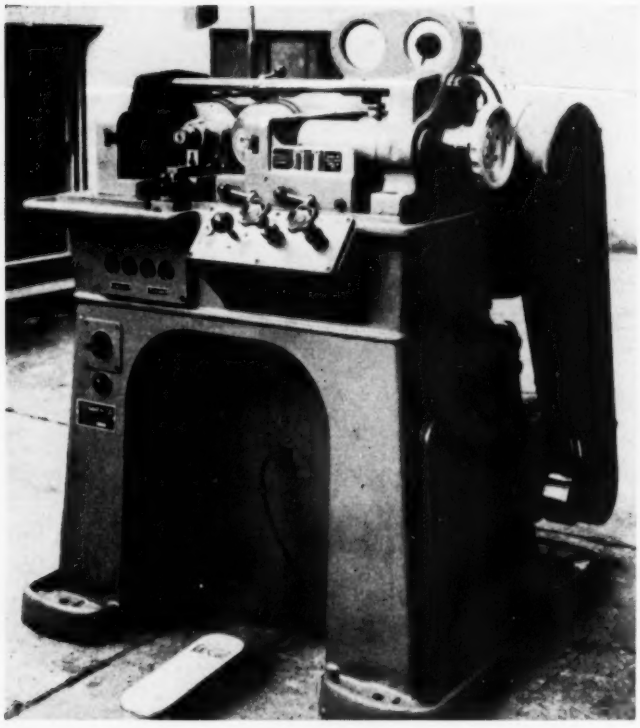


WE PRACTICE WHAT WE PREACH

Because we believe in our own gospel for eliminating vibration-loosened fasteners, we use FLEXLOCs to provide *positive locking* on the caster assemblies of our Hallowell Platform Trucks.

Perhaps you have a vibration problem. If so, send for samples and literature

SPS STANDARD PRESSED STEEL CO.
JENKINTOWN 1, PENNSYLVANIA



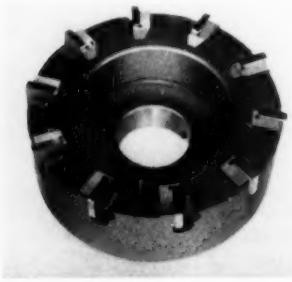
Thommen Thread-Rolling Machine For Chipless, Polished Threads

Maximum pressure	13,230 lb
Thread diameters	5/64 to 1 57/64 in.
Thread-rolling pitch	0.016 to 5/32 in.
Maximum rolled length	2 23/64 in.
Maximum metal hardness (tens. str.)	170,000 psi
Minimum elongation	12 to 8%

This Swiss machine (Thommen Type G-45) handles 120 to 1500 pieces per hr depending upon the kind of metal and the size of threads. It cold-rolls chipless threads with polished flanks and exact profiles in standard and special steels (including molybdenum, chrome-nickel, and stainless), most of the non-ferrous metals, and such light metals as aluminum and its alloys.

It rolls the threads with left- or right-hand pitch, multiple-pitch threads, threads within centers, very short threads with collars, and also conical threads. Price with standard equipment—$8500.

Carl Hirschmann Co., 50 Park Ave., Manhasset, N. Y.



Blades on Solid-Carbide Cutter Are Indexed When Dull

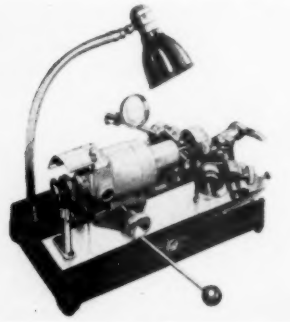
Futurmill face-milling cutters are used for milling cast armor plate and other difficult steel machining jobs.

The blades, when dull, are indexed to a new cutting edge since the clearance angles are taken care of by the position of the blade in the cutter body rather than being ground onto the blade.

The blade is square and is furnished in three optional sizes ranging from 1 to ¾ in. depending upon depth of cut desired.

The blades can be indexed or substituted without removing the cutter from the spindle. They can be indexed eight times before regrinding, which is then done on a gang setup on a surface grinder.

Detroit Milling Cutter Co., 28625 Grand River Ave., Farmington, Mich.



Dumore Drill Grinder For 2-Lip Twist Drills

This grinder handles No. 70 to ¼-in. twist drills, either straight or tapered shank. Any included angle of drill point from 90° to 160°, and any clearance angle from 5° to 15° can be obtained. Setup is claimed to be very fast.

A quick-locking chuck features an infeed for finish cuts on fine resharpening work, for extra-small drill sharpening, and for speed when extreme changes in point or clearance angle are required. A combined drill rest and diamond holder is provided for pregrinding broken drills and dressing rough-grinding wheels.

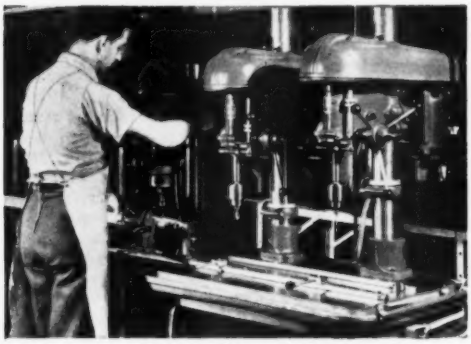
The grinder swings a 2x⅜x¼-in. wheel for sharpening. An identical wheel is mounted on either end of the motor-armature shaft for rough-grinding broken drills to shape, with a thinner wheel for web thinning. Standard equipment includes a 1¼-in. collet; chuck-extension drill-holder for No. 52—70 drills; diamond wheel dresser; and setup gage.

Complete range of collet sizes from No. 70—No. 1 in number sizes; 0.65 to 6.3 in millimeter sizes; 1/32 to ¼ in. in fractional sizes; and A—E in letter sizes are available as optional equipment.

Small drills that were previously discarded can now be satisfactorily resharpened—thus lowering costs.

Dumore Co., Racine, Wis.

HOW Delta Tools Solved Four Unusual Production Problems



TIME SAVING 50%—PRODUCTION INCREASE 100%

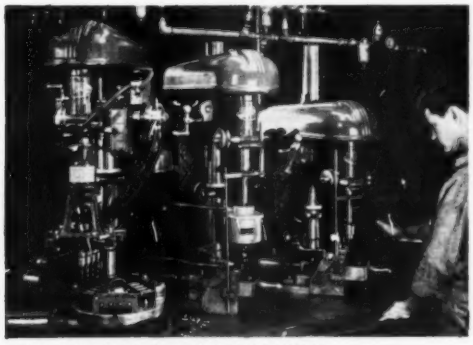
ALBERT SPECIALTY CO., CHICAGO, ILLINOIS

When lack of a 3-spindle drilling machine jeopardized vital sub-contracts on aircraft and signal corps equipment, this company combined a Delta 2-spindle unit and a Delta 1-spindle unit for drilling, countersinking and tapping six holes in each end of a tube used in a signal corps tripod. A special fixture made it possible to drill the phenolic tubing and brass casting simultaneously with different position limits to make tripods interchangeable. Result—a 50 per cent time saving and production increased 100 per cent over the old method.

ACCURATE HIGH SPEED DRILLING—NO SCRAP

OHIO BRASS CO., MANSFIELD, OHIO

To achieve precision accuracy at a cutting speed of 12000 rpm. in drilling and reaming forged aluminum blanks for fuse components, three Delta super high-speed drill presses were installed in sequence. Blanks are passed from one station to the next, and stops on the table make for quick accurate positioning. Scrap has been eliminated.



DRILL AND TAP 160 PIECES PER HOUR

EDWARD VALVES, INC., EAST CHICAGO, INDIANA

To increase production speed and reduce labor costs on valve stop collars, Edward Valves, Inc., installed three specially tooled Delta drill presses. Piece is put in machine at right and drilled, manually positioned but automatically clamped by air on drill downstroke. Center machine does tapping operation. Production rate—160 pieces per hour on both operations. Left machine drills valve lubricant screws with 5/32 drill, 500 pieces per hour, with 95% of operation actual machining time, only 5% for loading.

DRILL PHENOLIC PARTS WITH PRECISION ACCURACY

ACRO MANUFACTURING CO., COLUMBUS, OHIO

Delta Super-Hi speed drill presses solved three serious problems of drilling phenolic switch parts: (**1**) formerly drilled four switches to one bit—now drill 150; (**2**) enlarging holes close to edges of phenolic parts always resulted in 60% scrap because of breakage—with Delta scrap is only 10%; (**3**) drilling a .004 hole to tolerances of plus or minus .0005 formerly required two operations, drilling from either side. Now with Delta it is done from only one side.

There's a Delta Power Tool for Your Job— WOOD OR METAL WORKING

53 MACHINES—246 MODELS—MORE THAN 1300 ACCESSORIES

Your Delta dealer is listed in your Classified Phone Directory under "Tools"

DELTA MILWAUKEE

ROCKWELL

DELTA POWER TOOL DIVISION

Rockwell MANUFACTURING COMPANY

609L E. VIENNA AVENUE • MILWAUKEE 1, WISCONSIN

Cold Extrusion of Steel With Ordinary Presses, No Lubricants

The Mullins Koldflo process is cold extrusion — in combination with other press operations such as drawing, ironing, coining, and forging. In addition it can extrude forward or backward, compress and expand.

The method does not require special surface lubrication and the pressures required to make a steel bar flow in the cold state are surprisingly low. Standard presses already available can therefore be used. It was also discovered by Mullins that the steel flow can be accurately controlled with a minimum of internal and external pressure.

The process goes far beyond the cold extrusion used for making shells, which deals with heavy walled cylindrical shapes. Such objects as thin-walled pressure cylinders, shock-absorber cylinders, gear blanks, pulley hubs, bearing housings, and hub and axle components can now be produced.

Substantial cost savings as well as a superior product are reported. For example, scrap is virtually eliminated, as only enough metal to make the part is cut from the solid bar. Stamping, forging, or machining cylindrical objects from flat blanks or from rounds, of necessity wastes from 1/4 to 1/3 of the original steel.

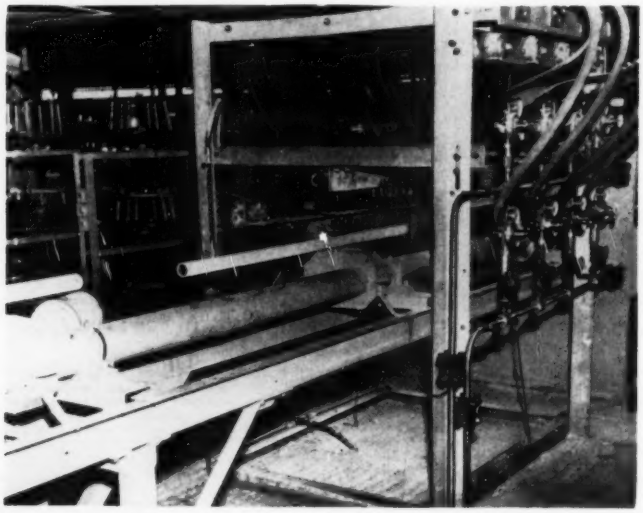
The process is said to be so exact that weight and size tolerances can be held within the limits required for most mass-produced, precision parts. Glass-smooth surfaces result, thus eliminating much finish machining. Other important economies come from the reduction of man-hours, machinery, and plant space over other methods of forming metal.

Another advantage is that a stronger steel is created through cold working the metal. With some products this means the elimination of heat treatment and the use of steel containing less alloy, such as manganese, chrome, and nickel.

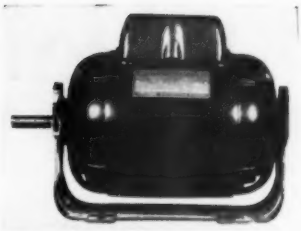
The Germans used cold extrusion during World War II in a limited way. A drawback of their technique was that it required extremely large presses and elaborate lubrication.

Mullins will license other manufacturers who want to use Koldflo. It includes the basic data and "know-how" and engineering service to assist the licensee to design and develop his own dies.

Mullins Mfg. Corp., Salem, Ohio



AUTOMATIC METALLIZING UNIT is blasting and then spraying aluminum on 2-in.-dia scaffold pipe at a speed of 1200 ft per hr. Thickness of coat is 0.004 in. ft long, the machine is so effectively controlled that only two men are needed for its operation. Cost is said to be less than 10 cents per sq ft for both blasting and metallizing. All ferrous and non-ferrous metals can be coated. The machine was built by Metallization Ltd., Dudley, England and is being sold in this country by the *Dix Engineering Co., Inc., 1415-17 Dix Rd., Lincoln Park, Mich.*



Single-Phase Capacitor Motors With Resilient Bases

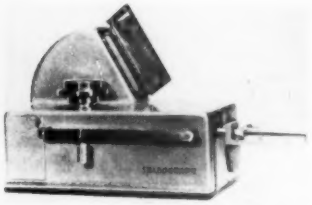
GE's Tri-Clad line of single-phase, capacitor induction motors are being offered with a resilient-base construction for use where freedom from vibration and extra-quiet operation are required. They are available on motors rated from ½ to 5 hp.

All single-phase motors have some torque pulsation—the resilient base isolates this vibration so it is not transmitted to the driven machine.

The Tri-Clad motor offers triple protection against physical damage, electrical breakdown, and operating wear and tear. Of cast-iron construction, it features a totally enclosed built-in transfer switch to keep foreign matter from the contacts, and a centrifugal mechanism designed for long life.

Except for the 5-hp size, which uses 230 volt only, the new motors operate on 115/230-v, 60-cycle power supply. Automatic-reset thermal-protective devices are available for use with the 1- and 5-hp, 1800-rpm models.

General Electric, Schenectady 5, N. Y.



MOMENT BALANCE SCALE is for checking moment weight of jet-aircraft-engine turbine buckets. Turbine bucket is held on lever extension fixture at distance from center pivots equal to turbine-wheel radius. Shift in center of gravity of turbine bucket will not vary dead weight but will change the distance from fulcrum and thus the moment weight. The dial and boom are graduated in moment weight units. Sensitivity of the scale equals 0.0005 in. lb. — *The Exact Weight Scale Co., Columbus, Ohio*

Hjalmar Ellstrom

INVENTOR OF THE GAGE BLOCK

• ESKILSTUNA

The achievement of perfection . . . the mastery of any art, craft, or science . . . is a rare human accomplishment. A discovery or an invention that contributes to the total welfare of all mankind is rarely the heritage left by a single man. So rare is it, indeed, that in such infrequent instances, the true facts surrounding its origin are often distorted, or even lost in the conflicting claims of others who would seek the worldly gains to be derived from undeserved fame.

So it was with the Gage Block. For, actually, this basic standard of measurement used the world around was originally conceived and invented solely and entirely by . . . Hjalmar Ellstrom. Here, briefly, is the story of his accomplishment:

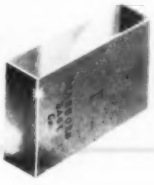
During the early 1890's, Hjalmar Ellstrom was employed by the government rifle factory at Eskilstuna, Sweden. He was a master craftsman . . . a man of infinite patience who took great pride in his work. He was a man of vision, too, who recognized the limitations imposed upon industry by the lack of sufficiently accurate measuring devices. So, with a then unheard of standard of precision as his ultimate goal, he alone developed and perfected his checking instruments and techniques . . . then alone he created the world's first gage block accurate to the infinitesimal millionth part of an inch.

Today, though his achievement has been copied and imitated by others, his personal unqualified devotion to accuracy is the exclusive heritage of Ellstrom . . . *now measuring in millionths for three generations.*

ELLSTROM STANDARDS DIVISION

DEARBORN GAGE CO. • 22035 BEECH ST. • DEARBORN, MICH.

Originators of Chromium Plated Gage Blocks



GE Automatic Battery Charger Can Be Shelf Mounted

For charging batteries in driver-lead and small driver-ride industrial lift trucks, the unit accommodates lead-acid batteries of 6 to 19 cells and nickel-iron-alkaline batteries of 10 to 30 cells. It is about the size of a tank vacuum cleaner with a control box mounted on its side, weighs only 190 lb, and can be installed on a shelf measuring $6\frac{3}{4}$x$8\frac{1}{4}$ in.

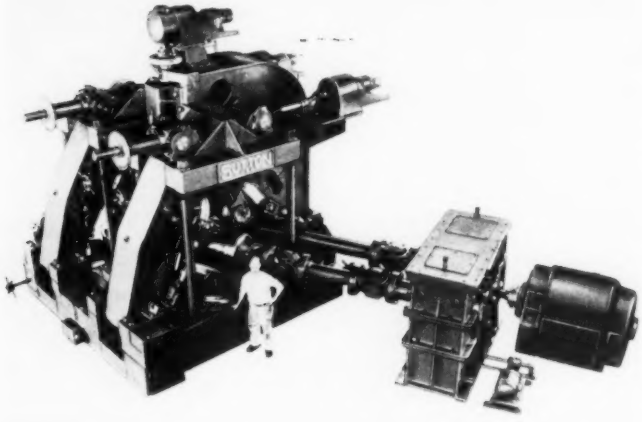
The unit is fully automatic and easy to operate, it is only necessary to plug it in and set the timer; controls do the rest. Voltage (based on number of battery cells) and current (based on ampere-hour battery ratings) are adjustable.

Protection from external damage to the charger is provided by completely enclosed construction, and maintenance, when necessary, is simplified by the easy accessibility of control parts, commutator, and brushes. Mounting feet are integrally cast with the intermediate frame, no special foundation is required. Permanent bearing alignment, established by factory assembly, cannot be disturbed during mounting.

Incorporated in the design of the unit are features recommended by the Industrial Truck Association. Included are: automatic disconnection of charger from power line and opening of charging circuit in case of power interruption, automatic restart, automatic control of charging rate under the modified constant-voltage charging system, and automatic cutoff when battery is fully charged.

The single-circuit equipment operates on 3-phase, 60-cycle, ac power, and has generator-overload and motor-overload protection to guard against excessive currents.

Small & Medium Motor Division, General Electric Co., Schenectady 5.



GUIDELESS tube and bar straightener uses seven straightening rolls; a group of three rolls at both entry and delivery end of the machine with an idler roll in the center. Power-operated screw-downs control stock size; group rolls are automatically adjusted for proper angularity. Straightening speeds vary between 60 to 240 fpm using a 200-hp, 300/1200-rpm adjustable-speed motor. Capacities, depending on model, 5/16- to 20-in.-OD tube and 5/16- to 12-in.-dia bars— ***Sutton Engineering Co., Bellefonte, Pa.***

Small, Versatile Press For Staking, Punching, Broaching

The Micro press is a small unit for light-duty work in staking, punching, piercing, reaming, broaching, marking, forming, and riveting.

Tools are guided by an adjustable cross-arm mounted on a tool-steel column. A hardened, ground, and lapped guide bushing in the cross-arm aligns the tool. The adjustable fixture plate mounted on the base contains 21 holes ranging from 0.013 to 0.185 in. in dia. Clearance between the fixture plate and cross-arm is adjustable up to $1\frac{1}{4}$ in. Standard models are provided with a hand lever.

A variety of punches with a wide range of end shapes and sizes are maintained in stock.

A special model with a micrometer depth adjustment is available—special tools, fixtures, and power adaptions.

Metalix Mfg. Co., 26 Fitch St., Norwalk, Conn.

NEW

HEAVY DUTY DIAL FEED

22" Diameter Table Top

4, 6, 9, 12, 18 or 36 positions

★

Positions up to 1000 lbs. quickly and accurately

★

Positive locking

★

Can be mounted in any position

LIGHT DUTY DIAL FEED

Model BRET-10C has a 10" diameter table top. Will position loads up to 500 lbs. Adjustable to position 4, 6, 8, 12 or 24 stations.

Bellows Model BRET-22 Rotary Feed Table is an electrically controlled, air-powered unit for dial feeding work pieces to drilling machines, tappers, reamers, press rams, etc.

Powered by a 3⅝" bore Bellows Air Motor, the standard 22" diameter table top will position loads of 1000 lbs., quickly and accurately.

At each station the table top comes to a stop gently, without abrupt impact, and is locked into position by a 1¼" bore air cylinder. Model BRET-22 is easily synchronized electrically to other machine operations.

The 22" diameter mild steel table top is easily removed for mounting jigs, fixtures, or oversize table top. Standard models can be set to position 4, 6, 9, 12, 18 or 36 positions.

Write for Bulletin T-85 Today! Address: The Bellows Co., Dept. AM-1051, Akron 9, Ohio

The Bellows Co.

AKRON 9, OHIO

1305

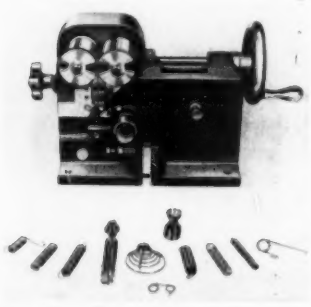
Market Forge Narrow Lift Truck Uses Stabilizing Casters

For special applications, the Loadmobile electric-lift truck is equipped with a narrow lifting platform. The width of the platform is only 18 in. and can be furnished in 6-, 7-, 9-, and 11-in. lowered heights to engage conventional pallets. Special platforms as narrow as 15 in. can be built.

Stabilizing casters are used on the unit sides because of the tendency of such a narrow model to tilt. The casters are spring mounted and normally are clear of the floor; when the unit tilts the heavy springs quickly return it to normal upright position.

The truck is battery-operated and has 3-way operating positions. Rubber wheels with sealed ball-bearings produce a minimum drain on the battery.

The Market Forge Co., Everett, Mass.



Changing of Arbors Unnecessary On Perkins Spring Coiler

This machine will make torsion, compression, extension, and tapered springs, coiled either right or left hand without changing arbors. Wire stock from 0.0005 to 0.125 in. can be handled. Springs can be made with or without initial tension and with open or closed ends.

The wire is fed down between two rolls through a guide, then is locked secure by a movable wire guide and arbor that is brought up into position on each side. Wire emanating from wire guide and arbor comes in contact with an adjustable grooved point called the coiling point.

By turning the handle, the gears revolve the two wire-feed rolls forcing the wire downward against the coiling point. The wire is then deflected into a coil. The raising or lowering of the coiling point by an adjustable knobbed screw causes the outside dia to be increased or decreased. Once the dia is established, any length spring can be coiled.

To form tapered or conical springs, the knob is turned during infeed of the wire.

Another knob creates lead or pitch. By turning it, a tool projects outward from the machine and presses against the spring.

The machine is manufactured by Perkins Machine and Gear Co., W. Springfield, Mass., and is being sold by:

Connors and Davis Sales Corp., Circuit Ave., W. Springfield, Mass.

Line Of Small Tools For Reaming and Countersinking

The reamers are ground and honed to give exceptionally sharp cutting edges, minimizing sticking. Made of heat-treated carbon steel, high-speed steels, or special alloys, the small tools are held to tolerances of + 0.0002 — 0.0000 in. Tool sizes are from 0.0005 to ¼-in. dia.

Three types of reamers are supplied, flat, half-round, and fluted (spiral or straight). Any of these are ground to give a taper, two or more steps, or a combination of taper and steps to meet job requirements. All reamers are made to order to job specifications.

Woodruff & Stokes Co., Inc., 349 Lincoln St., Hingham, Mass.

Variable-Speed Drive For Low-Speed Machinery

A countershaft drive as a package unit, provides wide speed variations for multiple applications. The variable-speed drive is designed for installations where driven-shaft speeds must be lower than motor-shaft speeds. The unit uses 7- and 8-in. combination sheaves and is available for drives from 2 to 15 hp.

Making up the assembly is a sealed ball-bearing countershaft stand, secured by rigid slide rods to an adjustable motor support for all motor sizes up to NEMA No. 326. The built-in control can be mounted in

BUSINESS IN MOTION

To our Colleagues in American Business . . .

For several years this space has been used to tell how Revere has collaborated with its customers, to mutual benefit. Now we want to talk about the way our customers can help us, again to mutual benefit. The subject is scrap. This is so important that a goodly number of Revere men, salesmen and others, have been assigned to urge customers to ship back to our mills the scrap generated from our mill products, such as sheet and strip, rod and bar, tube, plate, and so on. Probably few people realize it, but the copper and brass industry obtains about 30% of its metal requirements from scrap. In these days when copper is in such short supply, the importance of adequate supplies of scrap is greater than ever. We need scrap, our industry needs scrap, our country needs it promptly.

Scrap comes from many different sources, and in varying amounts. A company making screw-machine products may find that the finished parts weigh only about 50% as much as the original bar or rod. The turnings are valuable, and should be sold back to the mill. Firms who stamp parts out of strip have been materially helped in many cases by the Revere Technical Advisory Service, which delights in working out specifications as to dimensions in order to minimize the weight of trimmings; nevertheless, such manufacturing operations inevitably produce scrap. Revere needs it. Only by obtaining scrap can Revere, along with the other companies in the copper and brass business, do the utmost possible in filling orders. You see, scrap helps us help you.

In seeking copper and brass scrap we cannot appeal to the general public, nor, for that matter, to the small businesses, important though they are, which have only a few hundred pounds or so to dispose of at a time. Scrap in small amounts is taken by dealers, who perform a valuable service in collecting and sorting it, and making it available in large quantities to the mills. Revere, which ships large tonnages of mill products to important manufacturers, seeks from them in return the scrap that is generated, which runs into big figures of segregated or classified scrap, ready to be melted down and processed so that more tons of finished mill products can be provided.

So Revere, in your own interest, urges you to give some extra thought to the matter of scrap. The more you can help us in this respect, the more we can help you. When a Revere salesman calls and inquires about scrap, may we ask you to give him your cooperation? In fact, we would like to say that it would be in your own interest to give special thought at this time to all kinds of scrap. No matter what materials you buy, the chances are that some portions of them, whether trimmings or rejects, do not find their way into your finished products. Let's all see that everything that can be re-used or re-processed is turned back quickly into the appropriate channels and thus returned to our national sources of supply, for the protection of us all.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices:

230 Park Avenue, New York 17, N. Y.

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Pretty smooth grinding these days, Jim!

SIMONDS ABRASIVE CO.

Grinding Wheels

It's inspection OK's instead of KO's since Simonds Abrasive Company wheels were put to work in the grinding room. Why? Because Simonds wheels are accurately specified to give top results on the jobs they have to do. They're part of a complete line containing everything to smooth your way to real production efficiency . . . grinding wheels, mounted wheels and points, segments and abrasive grain . . . all made under complete quality control by Simonds Abrasive Company, a major manufacturer of grinding wheels for almost 60 years. Write for data book and name of your distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

any one of a number of positions to suit installation requirements.

The unit has been so designed that parts of the assembly can be combined into other drives. For example: The various parts can be assembled as (1) a sliding motor base only; (2) a sliding-countershaft base; (3) a fixed-center countershaft drive for ratios up to 8:1; or (4) a compound-variable drive with speed changes up to 64:1. Remote control devices are easily adapted to the unit.

Standard equipment does not include the multi-groove sheave and the motor.

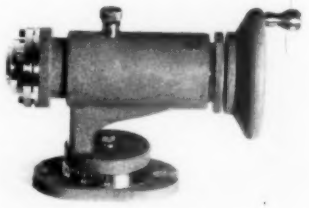
Speed Selector Inc., 118 Noble Court, Cleveland 13, Ohio

Anti-Friction Center Mounts on Independent Chuck

Center can be used for turning irregular-shaped pieces and for accurate alignment to the headstock when turning uncentered work such as forgings, castings, crankshafts, and other pieces.

It is mounted to the outside spindle of the tailstock and held by a hardened and ground tapered bushing. They can be made to fit any size or make chuck. Anti-friction bearings in the center are greased for life.

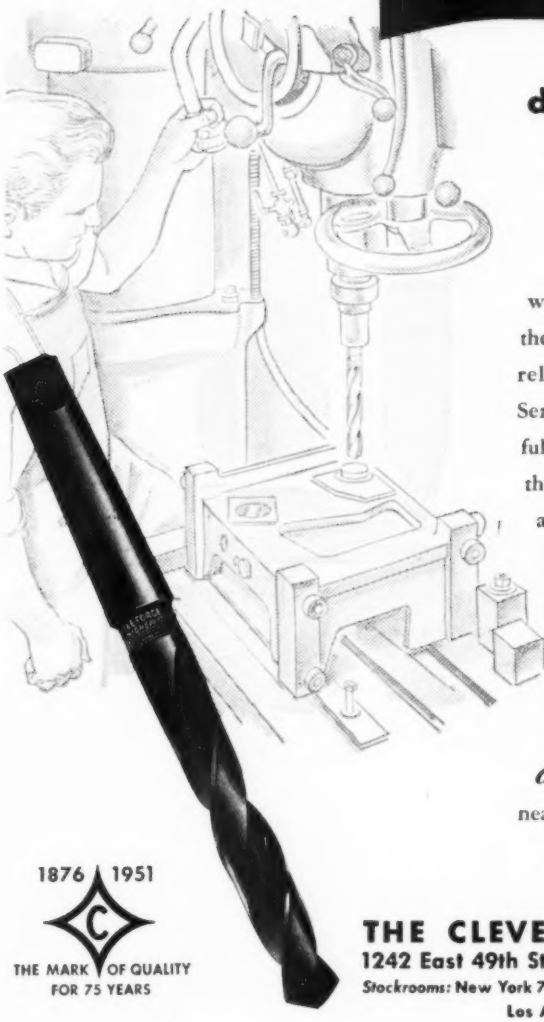
Ready Tool Co., 554 Iranistan Ave., Bridgeport, Conn.



Relief-Grinding Attachment Is Easily Setup

The I-G-C grinder can handle countersinks, center drills, integral pilot cutters, and right- or left-hand pilot drills. It fits any grinder, and takes work from 1/16 to 1 in. in dia with standard collets. The lift of the single cam is variable from 0.001 to $\frac{1}{8}$ in., and adjustment pins are pro-

NOW... ONE PASS



drills hole 3½ in. deep in 18-8 stainless steel

This was a slow and difficult job. There was considerable tool breakage, even though the operator made several pull-outs for chip relief on each hole. ◈ When a *Cleveland* Service Representative was called in, he carefully analyzed the set-up . . . and recommended the CLE-FORGE High Speed Drill illustrated at the left. This is a stock drill with a heavy web, and with flutes designed for easy chip removal. Now—because of the greater strength and rigidity of this drill—the deep holes are drilled in one pass. Breakage has been greatly reduced. ◈ Whenever *you* have a drilling problem, get the advice of a *Cleveland* Service Representative. Contact our nearest Stockroom, or . . .

Telephone Your Industrial Supply Distributor

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THE CLEVELAND TWIST DRILL CO.

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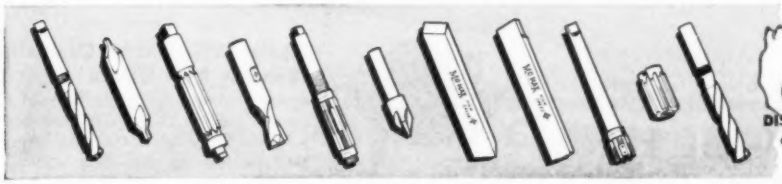
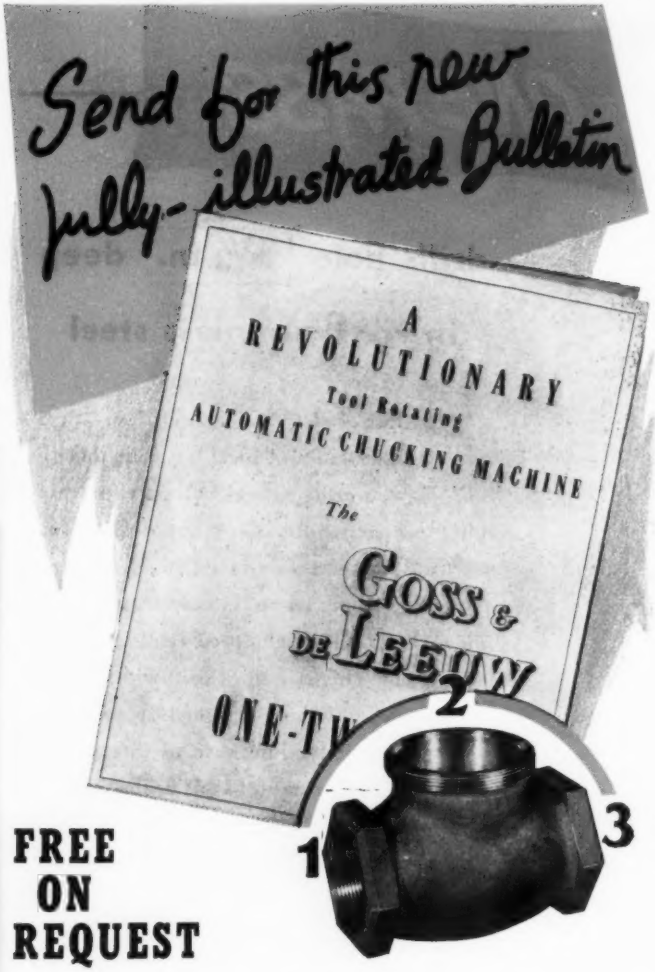


ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS



FREE ON REQUEST

Here are the answers to most of your questions as to what "ONE-TWO-THREE" means in describing this outstanding development of Automatic Chucking Machines by Goss and De Leeuw. You'll be interested not only in the revolutionary design of the machine itself, but also in its extraordinary performance—and how it is possible to handle from one to three operations—in sequence or simultaneously without changing set up.

Get this interesting, informative Bulletin NOW—by merely asking for it.

GOSS & DeLEEUW QUALITY PRODUCT-QUALITY

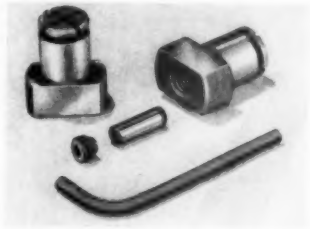
GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

vided for 1-, 2-, 3-, 4-, and 6-fluted cutter grinding.

By a quick change of collets, angle of fixture, and the lift cam, the fixture is easily setup for various grinding operations. Cutting edges are ground equally, thus reducing frequency of grinding.

Loading of the fixture is done in three simple steps: (1) Correct size collet is inserted; (2) Work to be ground is placed in the collet and locked in place with the handwheel; (3) Handwheel is turned to rotate the work against the grinding wheel. A locking pin holds the spindle rigid while the collet and work are being tightened.

Western Aero Industries, 3305 Burton Ave., Burbank, Calif.



Sine Fixture Key Eliminates Five Operations

This sine fixture key is reported to eliminate five operations heretofore necesssary in milling fixture-key slots.

The stemmed construction of the "S" fixture key requires a bored hole in lieu of the standard milled slot. This eliminates the usual milling operations and setups. In addition, the keys are interchangeable and have a self-contained locking device.

The Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland, Ohio

Tapping Attachment has Steel Balls To Reduce Axial Friction

Free axial motion of the tapholder in the body is fairly common—the purpose being to relieve axial pressure on the tap and thus prevent thread stripping and broken taps. The SPV attachment not only allows

3 famous SIP Measuring Machines

with built-in standard scales

for absolute measurements to .00005 in.

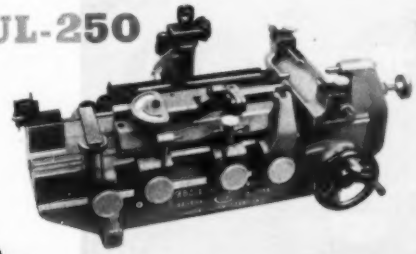
MUL-250

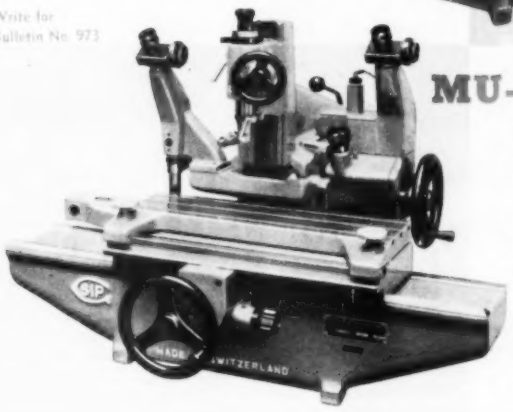
SHOP GAUGE MEASURING MACHINE

for the inspection of internal and external lengths and diameters, profiles, threads, etc.

Measuring range . . . . . 10"
Maximum diameter to be measured . . . 4"
Maximum length of threaded parts admitted 16"

Write for Bulletin No. 973





MU-214 B UNIVERSAL MEASURING APPARATUS

for the inspection of all kinds of gauges, tools, components, internal and external threads, racks, tracings, etc.

Measuring range . . 16" × 4" × 6"
Dimens. of cast iron table $19\frac{1}{4}$" × $5\frac{1}{2}$"
Dimensions of glass table $16\frac{1}{2}$" × $4\frac{1}{4}$"

Rotary table for measurements in polar coordinates, dividing head, goniometric microscope, special microscopes for various purposes, etc.

A most versatile measuring apparatus.

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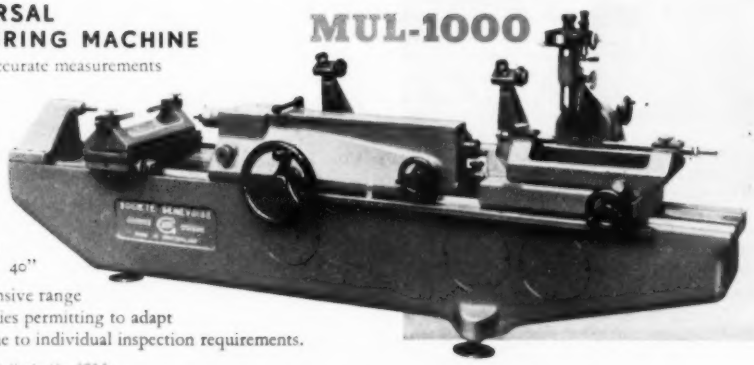
MUL-1000

UNIVERSAL MEASURING MACHINE

for most accurate measurements



Measuring range . . . 40"

Comprehensive range of accessories permitting to adapt the machine to individual inspection requirements.

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AMERICAN SIP CORPORATION

HIGH PRECISION MACHINE TOOLS AND MEASURING EQUIPMENT

100 East 42nd Street NEW YORK 17, N.Y.

ROTO FINISH

CUTS DEBURRING COSTS
50% to 90% on individual parts
at the WHIRLPOOL CORPORATION, St. Joseph, Michigan

...saves...

$0.395 per hundred pc
BRASS RETAINING RINGS
AFTER
BEFORE

$0.23 per hundred pc
CRANK ASSEMBLY PARTS
AFTER
BEFORE

$1.60 per hundred pc
CAM BARS
BEFORE
AFTER

helps 6 people do the work of 16

The Whirlpool Corporation found a real solution to manpower scarcities and rising prices when they installed Roto-Finish Deburring Machines. By this mechanical method, 6 people now deburr an even greater quantity of parts than 16 could do before. Thus a much needed source of manpower was found for use in other operations.

The cost of deburring individual parts has been reduced 50% to 90% as shown above. And in addition, parts can now be deburred economically that were impossible to do by hand methods because the cost was prohibitive. Roto-Finishing these parts in some cases has eliminated special handling in subsequent operations. As a result, production has been speeded and manhours have been saved in stamping, grinding and other finishing operations.

Let us show you how you can make similar savings in time, manhours and money. Send sample parts to the Roto-Finish laboratory for a free demonstration. Write for full details today.

Roto-Finish COMPANY
associated with The Sturgis Products Co.
3710 MILHAM ROAD KALAMAZOO, MICHIGAN

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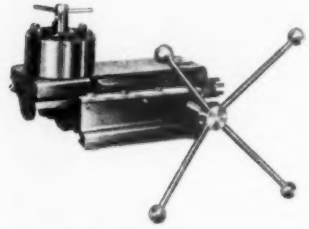
ORIGINATORS OF THE ROTO-FINISH PROCESSES

axial motion but also eliminates axial friction resulting from it by placing steel balls between the holder and body.

The attachment also has a slipping clutch which prevents overloading and automatically arrests the tap when it reaches the bottom of the hole. The clutch is adjustable for tapping threads of different dimensions and in widely varying materials. Adjustment is made by turning the outer sleeve to the indications shown by the numbered lines.

The attachment can be used on drilling machines, lathes, milling machines, etc., and ordinary hand taps and machine taps of standard types with ground profiles may be used.

Eric S. Johnson Co., 230 E. Ohio St., Chicago 11, Ill.



Newton Bed Turret Can be Pilot-Wheel Operated

The improved models of this line are designed to fit 10- and 11-in. Logan lathes, 10-in. Powr-Kraft, 10-in. Atlas, and 12-in. Craftsman lathes.

The turret head takes 6 tool positions and is self-indexing. The slide and bed have ground bearing surfaces.

The unit can be pilot-wheel operated, or can be equipped, as in the old model, with levers.

A. K. Tool Co., 2029 Blake Ave., Los Angeles 39, Calif.

Powdered Cutting, Grinding, Oils

A free-flowing, golden powder, when mixed in the proportion of two lb of powder to each 50 gal. of water, it produces a clear, light-green solution for grinding. It will replace all soluble oils, chemicals, and pastes.

Another powdered oil, a brown powder, produces a clear green solution when mixed in the proportion of 6 lb to 50 gal. of water. It is used in cutting to replace soluble oils and in some cases, straight oils.

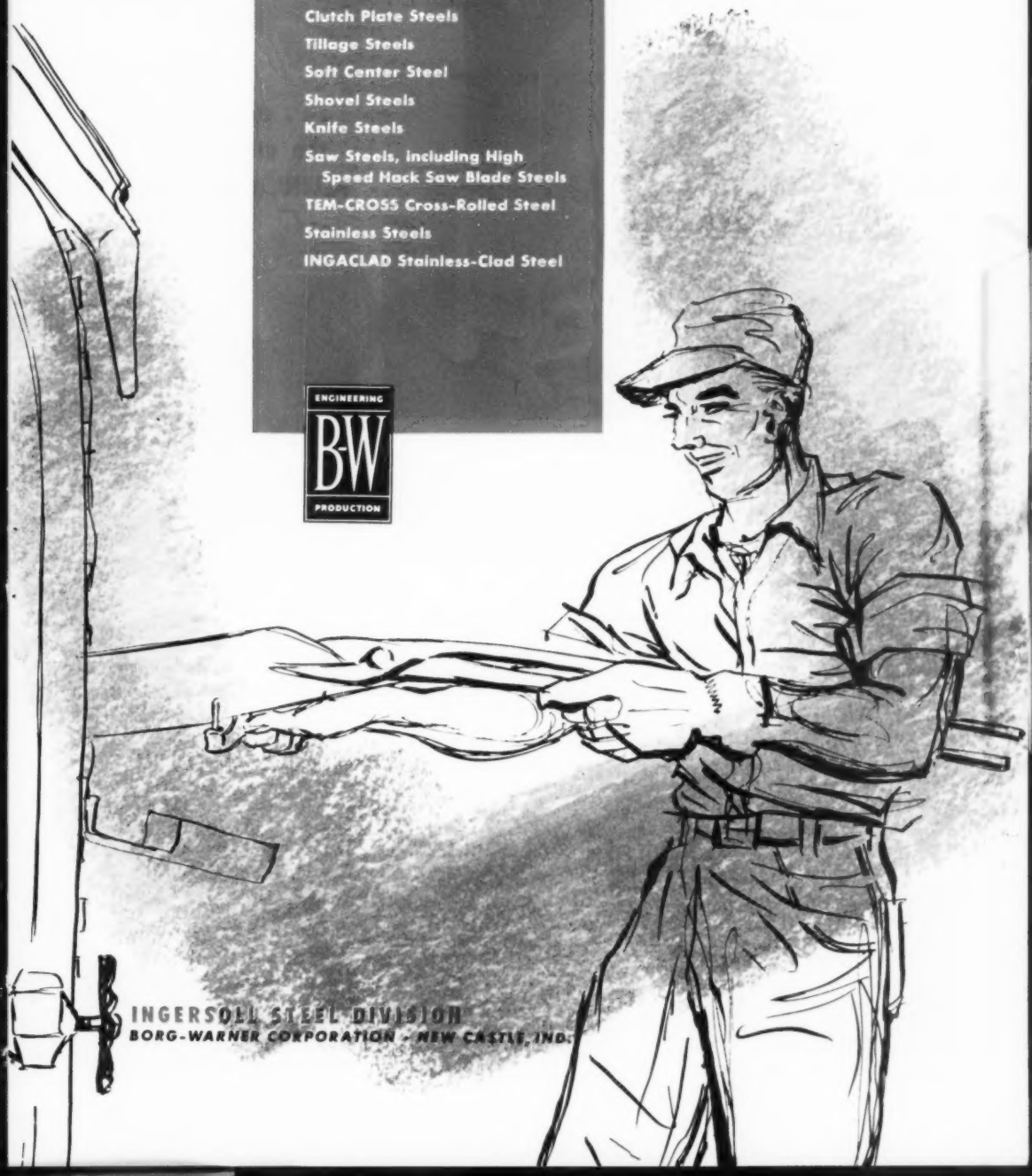
Advantages claimed include: Less

Ingersoll

SPECIALISTS
IN SPECIAL PURPOSE STEELS

- Alloy Steels
- Armor Plate
- Clutch Plate Steels
- Tillage Steels
- Soft Center Steel
- Shovel Steels
- Knife Steels
- Saw Steels, including High Speed Hack Saw Blade Steels
- TEM-CROSS Cross-Rolled Steel
- Stainless Steels
- INGACLAD Stainless-Clad Steel

ENGINEERING
B-W
PRODUCTION



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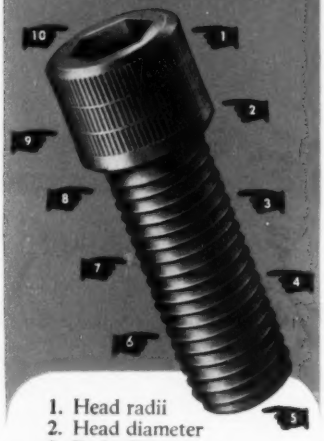
BORG-WARNER CORPORATION • NEW CASTLE, IND.

NOW scientific

Chart Control

maintains definite quality standards for these and other dimensions and characteristics of

ALLEN ⬡ SCREWS



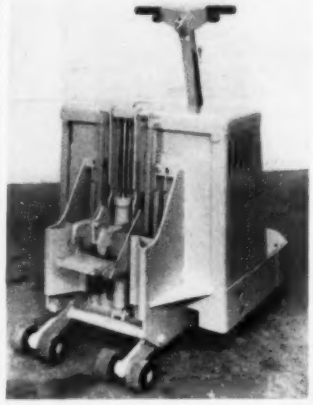
1. Head radii
2. Head diameter
3. Body diameter
4. Thread form
5. Lead error
6. Thread size
7. Rockwell hardness
8. Head - Body - Thread concentricity
9. Head height
10. Socket size and depth

WARNING
Allen-Type screws aren't necessarily Allen-Made.
Get genuine "Pressur-Formed" Allen⬡Head screws in this black and silver box.

THE ALLEN MANUFACTURING COMPANY
Hartford 2, Connecticut, U. S. A.

handling and storage space required. No steel drums; therefore no deposits and returning. No oil spillage, thus less waste and no safety hazard due to slippery floors. Stable solution will not separate; therefore a longer solution life. Freedom from odor, rancidity, greasiness, and gumminess.

Henry E. Sanson & Sons, Inc., 135 Quaker Ridge Rd., Manhasset, L. I.



Tractor Reduces Trailer Steering Radius

A motorized tractor that automatically engages various industrial trailers will permit accurate spotting and operation in very narrow aisles. It is possible with this device to engage the end of a caster trailer and make a right angle turn with the center of the turn being the fixed axle of the trailer, giving it the shortest steering radius possible.

In operation, the motorized tractor is driven to the end of the trailer and a pushbutton is pressed engaging a hook on the tractor with the lower side of the trailer frame. The hook then pulls the trailer into intimate contact with the tractor. Secondary hooks then act as auxiliary engagements.

The tractor trailing wheels then lift off the floor so that the weight of the rear end of the tractor is supported on the trailer and both form an integral unit. The entire operation takes but a few seconds.

The Grip-Tow tractor will operate successfully with almost any caster trailer having some edge projection which the gripping mechanism can engage.

Philadelphia Div., Yale & Towne Mfg. Co., Philadelphia 15, Pa.

ONLY

Leading Industrial Distributors

. . . can offer you the advantages of

ALLEN⬡HEAD PRODUCTS

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Shoulder screws . . . Allenuts
Flat head cap screws . . Keys
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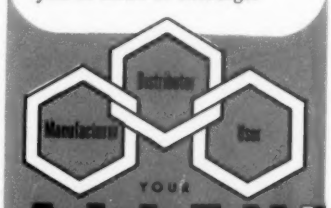
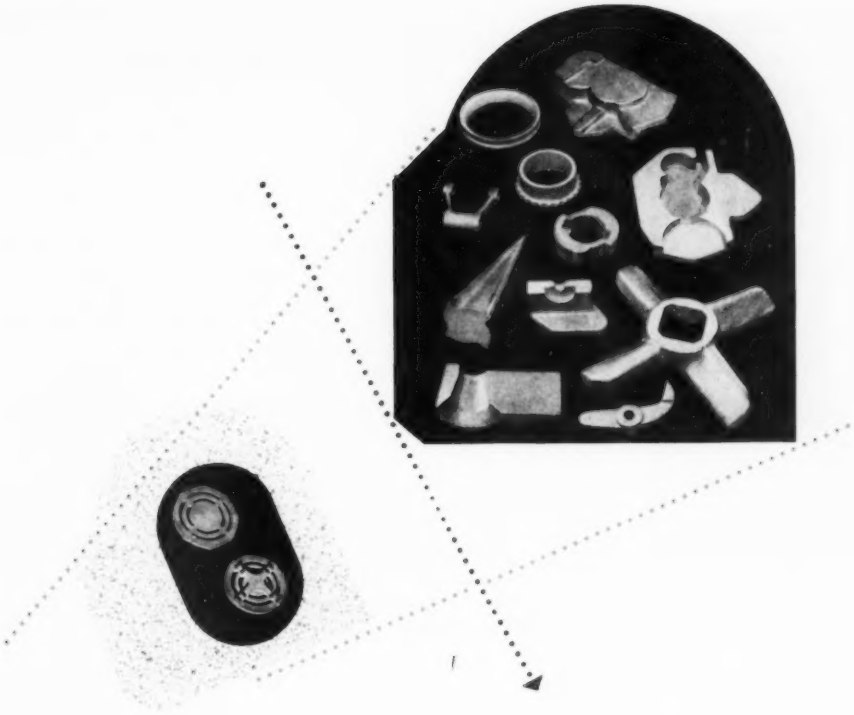
Plus . . .

The important help that an experienced supplier can give you in times of shortage.



YOUR ALLEN DISTRIBUTOR



Airkool Sand Castings

increase valve life **10** *times!*

A big-name refrigeration compressor company recently decided to redesign their equipment to increase the power rating by 33⅓. That meant the performance of the suction and discharge valves had to be improved. These valves are 3- to 4-inch diameter discs about ¼" thick with a number of radial slots closely controlled in width and shape for regulating gas flow volumes.

These valves were formerly made in cast iron, but frequent breakage in service, and excessive wear ruled out cast iron for the improved compressors.

Crucible metallurgists were called in and met the challenge with Airkool Sand Castings specially designed for the valves. Airkool is a Crucible air-hardening tool steel noted for abrasion resistance and excellent non-deforming properties during heat treatment. By closely controlled foundry technique, the slots in the casting were held to the close tolerances needed. Expensive machining was avoided, and the valve not only gave improved performance, but its life was *increased more than 10 times.*

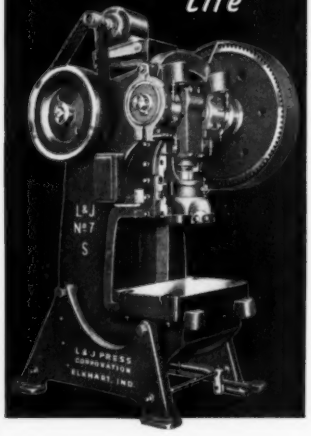
If you have a sand castings application, call on us. CRUCIBLE STEEL COMPANY OF AMERICA, General Sales and Operating Offices, Oliver Building, P. O. Box 88, Pittsburgh 30, Pennsylvania.

CRUCIBLE first name in special purpose steels

51 years of Fine steelmaking **SAND CASTINGS**

REX HIGH SPEED • TOOL • STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

L&J PRESSES
for Longer Die Life



Exceptionally rigid frames; extra long gibs and large bearing areas, accurately machined, prolong die life. There's no guesswork about frame deflection in L&J Presses. A unique testing method measures the actual deflection of every design under load.

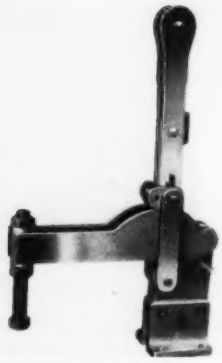
This is only one of the features of L&J Presses that contribute to economical, dependable productioa. It will pay you to find out more about them. Made in 6 to 80 ton capacities.

WRITE FOR LITERATURE

SPECIFICATIONS
NO. 7 BACK GEARED PRESS
(illustrated)

80 ton capacity, 4" standard stroke, 41 strokes per minute, 15-1/2" or 20" die space (bed to slide, stroke down, adjustment up), 38" x 24" bolster plate area L. to R. x F. to B., 12-1/2" throat depth, 17-1/2" opening through back, 15,000 lbs. net weight. Also available in plain flywheel type.

L&J PRESS CORP.
1629 Sterling Avenue
ELKHART, INDIANA



Quick-Action Clamps Have Heavy Capacity

These clamps are said to be the only big cam clamps that provide a convenient means for locating and adjusting the spindle assembly along the toggle bar. They simplify applications where parts (such as heavy castings and larger forgings, or stacked stampings) having varying thicknesses can be held without altering the initial setting or where parts that are sprung can be aligned before welding. The spindle assembly can also be replaced by a special pressure pad to suit particular clamping applications.

Model CAV-1200 has recommended force of 1200 lbs. at end of toggle bar and 2550 lbs. with spindle located 3⅛-in. from front of base. Model CAV-2000 (slightly larger) has recommended force of 2000 lbs. at end of toggle bar, and 4150 lbs. with spindle 3¼ in. from front of base.

Models CAS-1200 and CAS-2000 are like the above but have the additional advantage of permitting the toggle bar to swivel around the base to any position within 180°, widening the scope of applications.

Lapeer Mfg. Co., Lapeer, Mich.

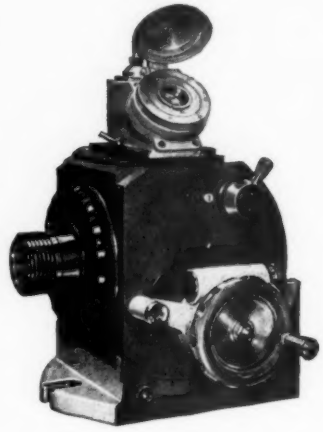
Improved Possons Safety Device For Punch-Press Operators

Three improvements have been made in the Possons Safety device to give additional safety and ease of maintenance.

The pull-back adjustment, which controls the location of the operator's hands, can now be made while standing on the floor. A single adjustment takes care of both hands—turning a knurled nut on a 10-in. screw will lower or raise the clip to the pullback at the correct place. Due to its being ball-seated, the nut will not slip or turn while in use.

After the adjustment is made, the

INDEXING
Precision
INDEPENDENT OF BACKLASH, OIL FILM THICKNESS OR MECHANICAL WEAR



When you index work on machine tools with an OPL Dividing Head, the sources of error inherent in mechanical indexing are eliminated.

Not only is great precision possible, but the simplicity of visual indexing permits fast operation. You read direct from a clear scale, greatly magnified. No charts or interpolations are required. The chance of human error is minimized.

WRITE FOR OPL CATALOG
F. T. GRISWOLD MFG. CO.
WAYNE 2, PA., U.S.A.
Griswold
OPTICAL POSITIONING

WORKHORSE...

- Generous Sized Cabinet
- **Conditioned Cooling System**
- **Built-In Checklite System**
- **Oversized Components**
- **Filament Voltage Regulation**
- **Industrial-type tubes**

Generous sized cabinet large enough to provide safe-spacing between high voltage components—offers unusual accessibility for preventive maintenance.

Yes... rugged and reliable... Lindberg Induction Heating Units are industrial workhorses for the long pull. Built to serve... and serve—hour after hour —day after day... far beyond the usual capabilities of Induction Heating Equipment.

Performance records from plants throughout the nation show 24 hour a day operation—month after month. Investigate the Lindberg Induction Heating Units—you will profit from proved ability to give reliable 24 hour a day operation. Ask for Bulletin 1440.

LINDBERG HIGH FREQUENCY DIVISION

Lindberg Engineering Company, 2448 W. Hubbard Street, Chicago 12, Illinois

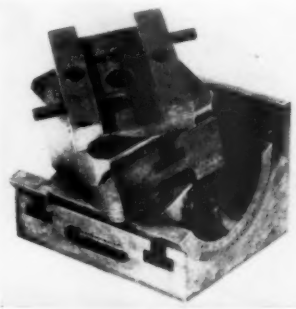
SUPERDIE
High Carbon, High Chrome, Oil Hardening
ATMODIE
High Carbon, High Chrome, Air Hardening
STAR
Die-Steel
PERFORMERS
OILDIE
Non-Deforming Extra Quality
EXL-DIE
Standard, Non-Deforming
TOOL COLUMBIA STEELS
COLUMBIA TOOL STEEL COMPANY
Main Office & Works — Chicago Heights 2, Illinois
There are Columbia warehouses and highly trained Columbia representatives in principal cities. For service for quality, look to Columbia—producers of fine tool steel by the electric process.
EZ-DIE
Air Hardening. (Cr 5.%)

hinged, perforated cable guard is closed. It may be locked if desired.

Solid pins are now being used for adjusting the ram connection rod. They are held in place by a 2-in.-length of coil spring.

The third improvement is an arrangement for hanging the hand straps on the face of the bolster when the operator leaves the press. Upon his return, he is automatically reminded to put on the straps.

The Possons Safety Mfg. Co., 4411 Perkins Ave., Cleveland 1¼, Ohio



Universal Rocker Vise For Grinding Compound Angles

Universal vise enables any compound angle to be ground without the use of angle parallels—even if the top has a complicated clearance. The vise is composed of a base, then a sub-base sandwiched by two rockers. On the last rocker is the holder for tools up to 1½-in. wide. The top rocker will compensate to obtain proper angles on ends. Both rockers are scaled, there being four graduations. A lock holds the sub-base to the lower rocker. The unit is as accurate as can be determined with the naked eye.

Tools can be ground on the ends by flipping the vise on end to set it on the other flat surface of the base.

Combination Vise and Jig Co., Orfordville, Wis.

Simonds Die Steel Available in 36-in.-Length Bars

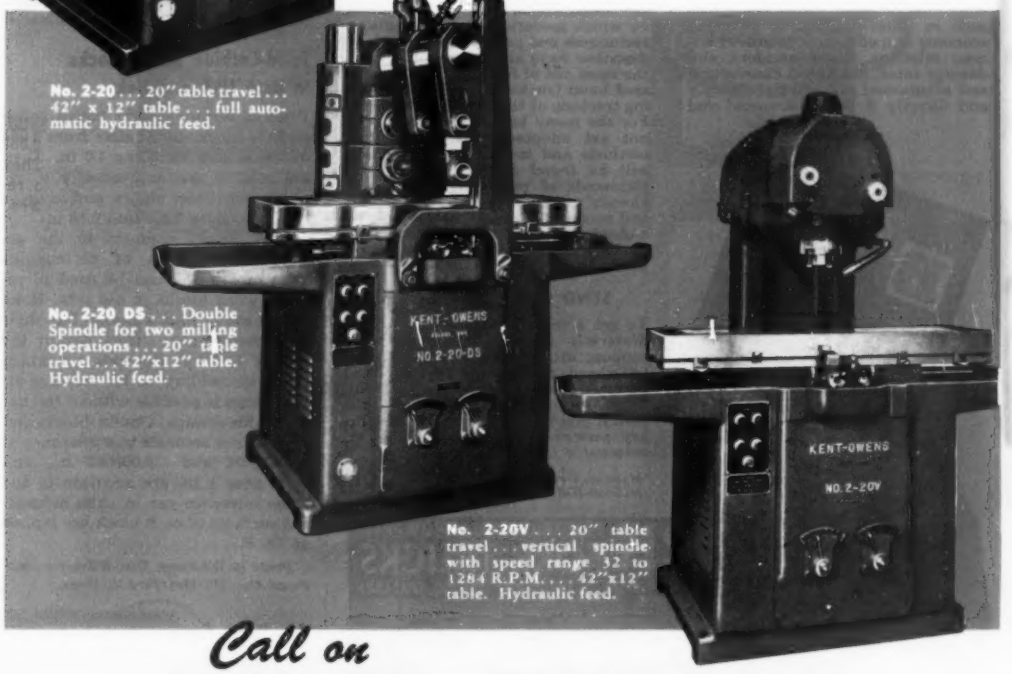
Simonds Red Streak flat-ground die steel is available in 36-in.-length bars in 35 standard stock sizes from ½x2 in. up to 1½x10 in. The bars are slightly over 36-in. length to allow for several saw cuts.

A chemical analysis of this oil-hardening, non-deforming die steel is C .85—.95, Mn 1.30—1.50, Si .20—.35, Mo .20—.30. Because of uniform annealing, it is claimed to be easily sawed, filed, and machined. Accu-

Speedy Accurate Milling Saves Labor!

On countless jobs—Kent-Owens Milling Machines have shown ability to turn out work with top speed and high accuracy. They're designed for rapid, easy set-up and operation. Rugged . . . with twin-post head mounting that assures balanced load—no chattering. Practical features throughout to help you *produce more* . . . with *lower costs!* Write for bulletins on the Kent-Owens Standard line . . . including wide range of hydraulic and hand operated machines. Also, let our engineers help you with tooling and special machine requirements.

Kent-Owens Machine Co., Toledo, Ohio.



No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.

No. 2-20 DS . . . Double Spindle for two milling operations . . . 20" table travel . . . 42"x12" table. Hydraulic feed.

No. 2-20V . . . 20" table travel . . . vertical spindle with speed range 32 to 1284 R.P.M. . . . 42"x12" table. Hydraulic feed.

Call on KENT-OWENS For Milling Machines

BASIC FACTS ABOUT MODERN MATERIALS HANDLING

HOW IT WORKS — WHAT IT DOES— WHAT IT SAVES

Study of major importance to business and industry is made available by CLARK

A practical, profitable way to produce more goods with the same amount of human effort, is presented simply and graphically in a new booklet offered by the Industrial Truck Division of the Clark Equipment Company, of Battle Creek, Michigan.

This booklet points up technological advances in materials handling operations that are effecting extraordinary benefits for industry—such as faster production, increased economy and efficiency, improved human relations, lower accident and damage rates, quickened distribution and substantial cash savings. Simply and directly it describes tested and proved means to help speed up and perfect the imperative integration of a military and a civilian economy

2-BILLION SAVING POSSIBLE

Concretely, this study points up a quick and certain way for Industry to save some $2,000,000,000* annually at a time when the country, faced with a rearmament program of 50 billions a year for at least three years, is in desperate need of every possible mechanical aid to save time and speed production. Many advantages in other directions, not reckoned in dollars and cents, will be recognized at once by every reader.

This new CLARK study is neither fancy nor complex. It is a well-illustrated, simply-written exposition of the sound and sensible fundamentals on which modern materials handling techniques and practices are based. It describes ways and means of getting the most out of fork-lift trucks, powered hand trucks and industrial towing tractors, at the least possible cost. For the many businesses which have not yet adopted modern handling methods and machines, the booklet will be found invaluable. For the thousands of progressive businesses already employing modern methods and machines, it is just as valuable as a check against omissions, abuses and opportunities for full achievement of production goals and potentials.

SEND FOR YOUR COPY

To get a copy of *"Basic Facts About Materials Handling"* fill out the coupon, attach it to your business letterhead and mail it to the *Clark Equipment Company, Industrial Truck Division, Battle Creek, Michigan.* If you want additional copies for key personnel, they are available in reasonable quantities.

**Materials Handling Case Book; McGraw-Hill Book Co., Inc. 1951*

CLARK ELECTRIC AND GAS POWERED FORK TRUCKS
AND POWERED HAND TRUCKS · INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION · CLARK EQUIPMENT COMPANY · BATTLE CREEK 3, MICHIGAN

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AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

rately ground to a thickness limit of plus or minus 0.001 in., all bars have a smooth surface finish.

Its wide hardening range (1450 to 1540 F) is said to assure uniform heat treatment in all thicknesses with a minimum of shrinkage or warping. Hardening instructions are on the wrapper of each individually packaged bar.

Simmonds Saw and Steel Co., Dept. A, 470 Main St., Fitchburg, Mass.

Solid-Carbide Gage Blocks In Both USA and Hoke

Pratt & Whitney have added solid-carbide blocks in all sizes from 0.050 in. up to and including 4.0 in. They are sold in sets, individually to replace worn steel blocks, and as wear blocks in sizes 0.050 and 0.10 in.

USA blocks conform to the accepted dimensions of rectangular gage blocks and can be used to replace worn blocks in old sets. Hoke blocks are of square design like their steel forerunners. They permit the use of internal tie rods by which rapid assembling of the various attachments is possible without the use of outside clamps. One-in. blocks and smaller are accurate to a tolerance of +0.000004 and −0.000002 in., and sizes over 1 in. are accurate to the same tolerance per in. The measuring surfaces of each block are lapped at 68 F.

Pratt & Whitney, Div. Niles-Bement-Pond Co., W. Hartford 1, Conn.

Arc Drive Control For Westinghouse Rectifier Welders

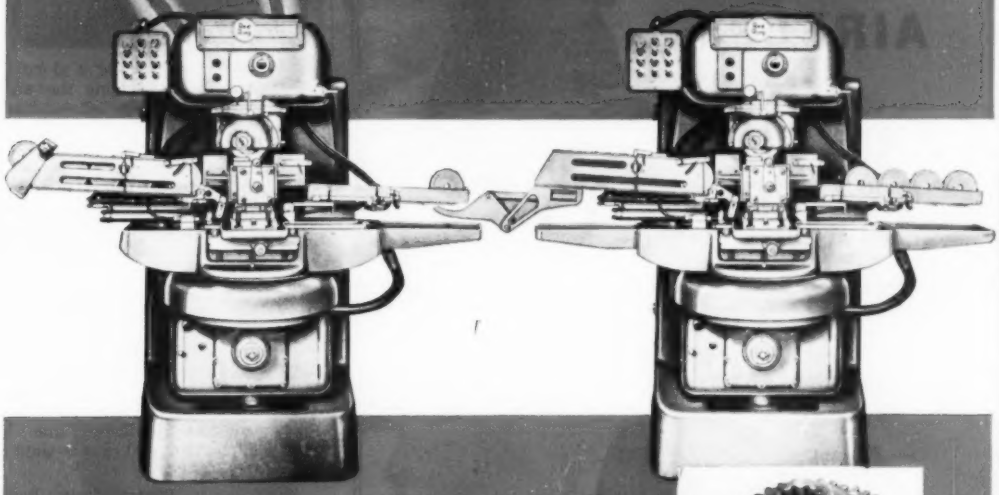
The control produces electrical transient-arc characteristics desirable for the particular job.

The device operates automatically and instantaneously to provide an extra surge of welding current at the moment the arc becomes shorted, either by contact between the elec-

RED RING Straight Line Automatic Loader

Saves Time and Conserves Manpower

In Shaving Cluster Gears



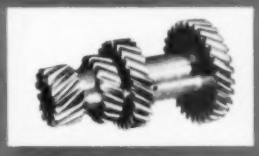
This new Red Ring Loader puts the shaving of cluster gears on a continuous automatic basis with important savings in time and manpower.

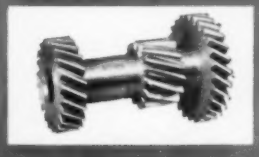
Although the illustration shows a battery for shaving a two step cluster, additional machine units may be added for as many additional steps as necessary.

All machines in such a battery are synchronized, but each unit is individually controlled and may be individually operated when desired. Each incorporates the universally accepted crossed axes principle of shaving.

A single operator is needed merely to supply unshaved gears to the magazine feed of the first machine and to remove the completed gears from the discharge chute of the final machine. All handling between machines is done by the automatic mechanical transfer mechanisms. All operations are in full view of the operator at all times.

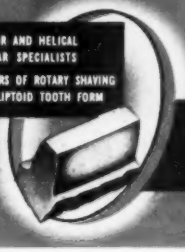
Write for full description and savings.





SPUR AND HELICAL GEAR SPECIALISTS

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM



NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

PRESS-RITE

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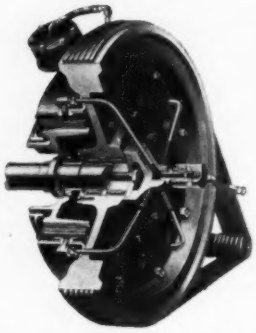
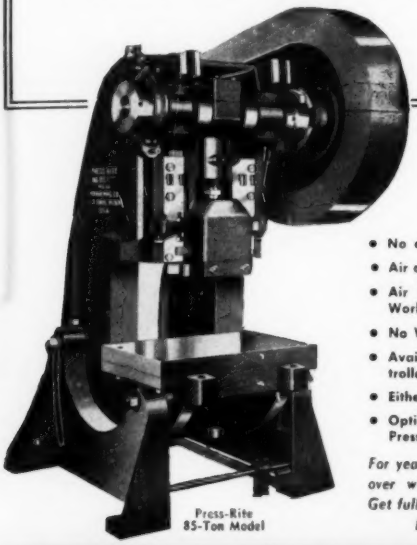
PRESS-RITE FEATURE!

. . . The New PRESS-RITE

AIRFLEX AIR FRICTION CLUTCH



We offer you the greatest air clutch ever built into a punch press! Incorporated into this new Press-Rite Airflex Clutch is an airflex unit—a proven product of many years. Hundreds of press users report little or no maintenance cost. We take great pleasure in announcing that we have incorporated this unit in our clutches.



Press-Rite 85-Ton Model

CHECK THESE FEATURES:

- No adjustment for wear
- Air and Spring Safety Brake
- Air Pressure Regulated to Suit Your Work
- No Worry About Excess Heat
- Available Either Air or Electric Controlled
- Either Push Button or Foot Controls
- Optional Equipment for All Press-Rite Presses, 20 to 85 ton Capacity.

For years airflex unit clutches have taken over where other clutches have failed. Get full facts on this and other job-proven Press-Rite features, TODAY!

Sales Service Machine Tool Co.

PRESS-RITE PRESSES · SHAPE-RITE SHAPERS · KELLER POWER HACK SAWS

2347 UNIVERSITY AVENUE
ST. PAUL 4, MINNESOTA

trode and the work or by a globule of molten metal bridging the arc gap. This extra surge of current helps clear the arc path and prevents arc outage or sticking of the electrode. Violent and prolonged overshoots and undershoots of welding current, characteristic of rotating type welding generators, are eliminated.

The amount of arc drive desired can be set by the operator. An "off" position is for use when the machine is to be short-circuited on low-resistance loads for any appreciable length of time—such as resistance heating.

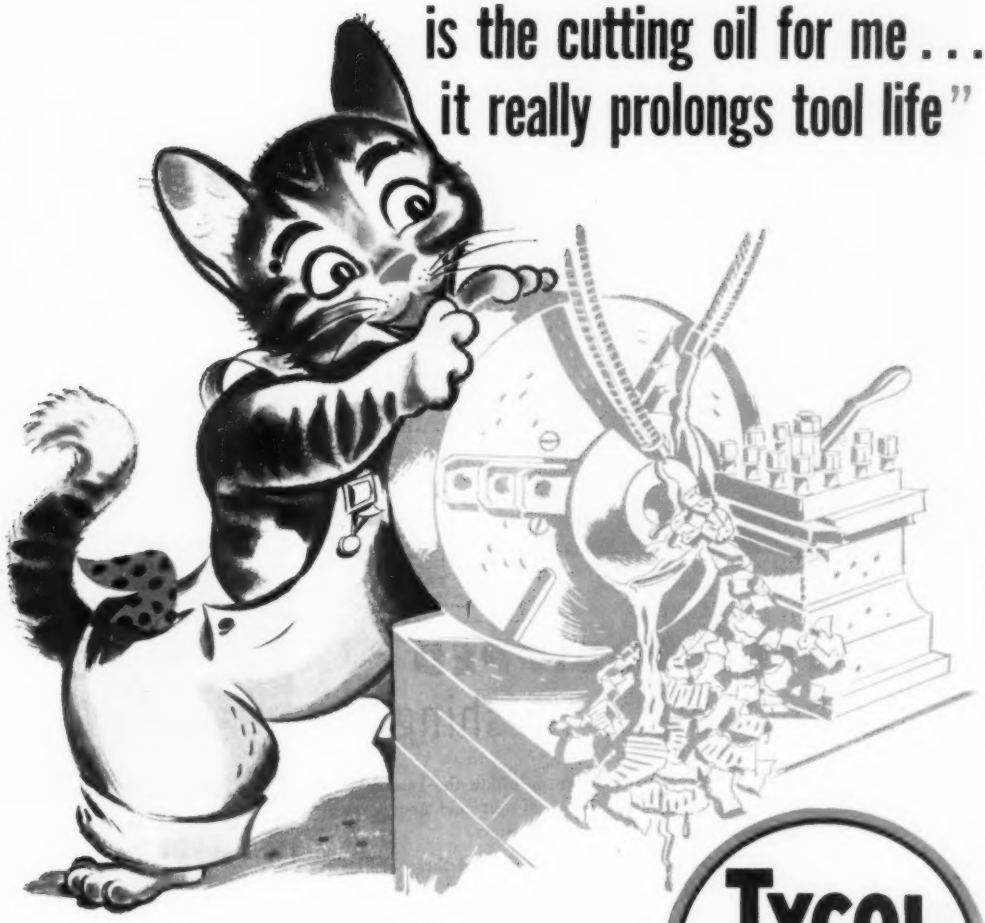
A self-heating thermostat protects the circuit from overheating due to sustained short circuit of the welding terminals.

Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.

Improved Dillon Low-Range Tester

Improvements in this universal tester include a 0—300 lb scale which is suitable for testing heavier materials than heretofore. Top range

"Tycol Amulkut is the cutting oil for me . . . it really prolongs tool life"



That's 100% correct! Tycol Amulkut Cutting Oil speeds up production by permitting freer, faster cutting . . . assures uniformly finer finishes. It also cuts cost by reducing spoilage, and prolonging tool life . . . regrindings are few and far between.

Tycol Amulkut is readily emulsified, and is specially designed for use in this form . . . it is available in grades for normal and heavy-duty cutting.

For more information, call your nearest Tide Water Associated office.

TYCOL

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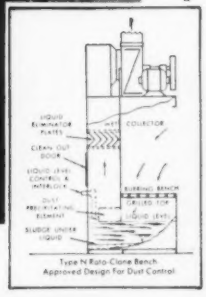
SEND FOR A FREE COPY OF "TIDE WATER ASSOCIATED LUBRICANIA"

today's best buy is better air!

Type N Roto-Clone Bench for Magnesium Finishing Operations, Dictaphone Corporation, Bridgeport, Connecticut



Type N Roto-Clone Bench Approved Design For Dust Control

SAFELY EQUIPPED
for light metal finishing

AAF ROTO-CLONE Type N Bench Removes Hazard Of Magnesium Dust at Dictaphone Corp.

The Type N ROTO-CLONE* dynamic precipitator has a remarkable safety record in efficient collection and safe storage of dangerous dust. Developed by AAF engineers for magnesium finishing, this unit or bench type wet-collector has no moving parts, pumps or nozzles, yet maintains the highest efficiency in collecting extreme fines. The Type N ROTO-CLONE immediately removes incendiary dust from the source by passing entrained material through a sinuous water curtain under heavy turbulence . . . induced by the flow of air through a stationary impeller. Dust is stored at once in sludge form within the base of the self-contained unit, and under water for complete safety.

The eleven sizes and three arrangements of Type N meet requirements for all dangerous finishing operations, such as stand grinding, burring, buffing, sawing, etc. Unit design also provides additional safety factors by allowing isolation of operations.

If incendiary dust is one of your problems, call your nearby AAF representative or write for Engineering Bulletin No. 277 A.

**ROTO-CLONE, is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

AAF **American Air Filter**
COMPANY, INC.

207 Central Ave., Louisville 8, Kentucky • In Canada: Darling Bros., Ltd., Montreal, P. Q.

had previously been only 0—100 lb.

An improved motor drive assures full torque up to 300 lb direct loading. Stepless speed control is operable from 0 up to 20 ipm.

A solid shaft now connects the speed control to the motor transmission. This makes possible a more positive and accurate setting of speeds without danger of overruns.

The quadrant arm is one casting to give greater rigidity and therefore smoother stress-strain curves.

The speed-control dial is mounted on top of the tester base instead of on the front of the machine. This gives greater ease in reading and making adjustments.

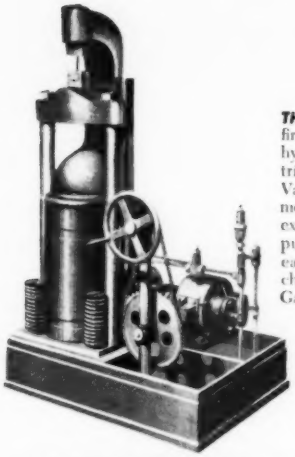
W. C. Dillon & Co., Inc., 1421 South Circle Ave., Forest Park, Ill.

Portable Power Shears For Sheet-Metal Work

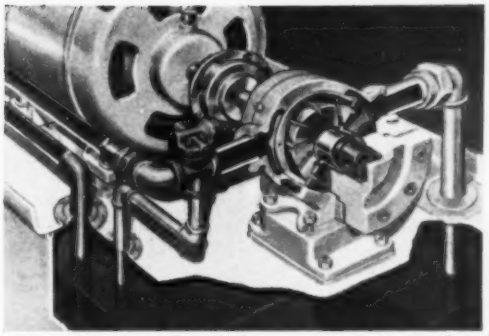
The German-made Flex portable shear comes in four models: the DP4—cuts black sheet metal to a maximum thickness of 0.071 in. (1.8 mm) at rate for max of 98.5 ipm; the DP9 which cuts to a max of 0.098 in. (2.5 mm) at rate of 98.5 ipm; the DP12 for a max thickness of 0.138 in. (3.5 mm) at rate of 98.5 ipm; and the DP 14 with capacity of 0.177 in. (4.5 mm) at rate of 59 ipm. Weights are respectively, 6, 10.5, 18, and 22 lb.

The construction of the tool is such that the operator always has good visibility when following scribed lines. Universal motor for ac and dc of small voltage, ball-bearing construction, and metal housing with built-in tumbler switch are other features. Three pairs of special steel cutters and two spare carbon brushes are supplied.

R. Caluwaerts Co., Inc., 1 West 67th St., New York 23, N. Y.



THE PIONEER—When oil first displaced water as the hydraulic medium in industrial machinery . . . Socony-Vacuum pioneered development of these products. For example, this first Hele-Shaw pump, which operated an early Baldwin testing machine, was charged with a Gargoyle hydraulic oil.



THE MOST—Down through the years, Socony-Vacuum has been a leader in every major development in hydraulic oils. Result? . . . Today, more hydraulic systems in industrial machinery are filled with Socony-Vacuum products than with the products of any other oil company!

FIRST IN HYDRAULICS

IN EVERY WAY!

Why Accept Anything Less?

There's a reason for leadership in every field – and in the field of hydraulic oils, Socony-Vacuum products are recommended and approved by more builders of hydraulic mechanisms than the products of any other oil company! Here's why . . .

Famous Gargoyle D.T.E. Oils are top quality – embody all the properties necessary for trouble-free performance of hydraulic mechanisms of every size and type. They assure more continuous operation, increase production, extend periods between drains, materially reduce maintenance costs.

Why accept anything less for *your* machines?

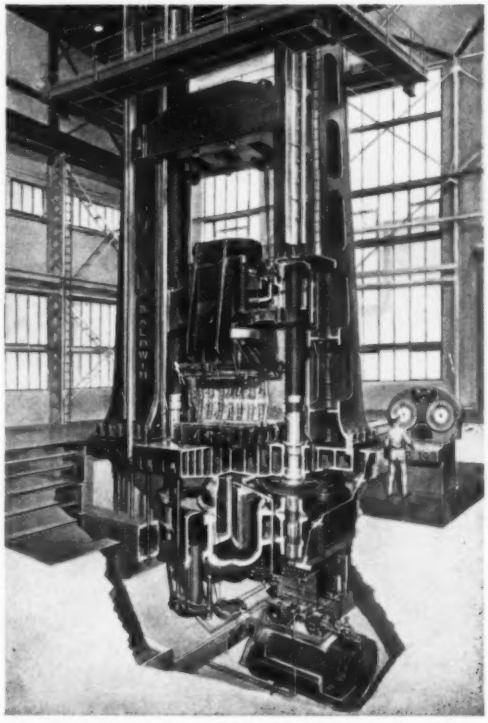
SOCONY-VACUUM

GARGOYLE Lubricants

SOCONY-VACUUM

Correct Lubrication

WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE



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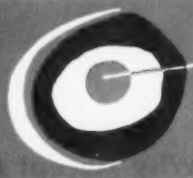

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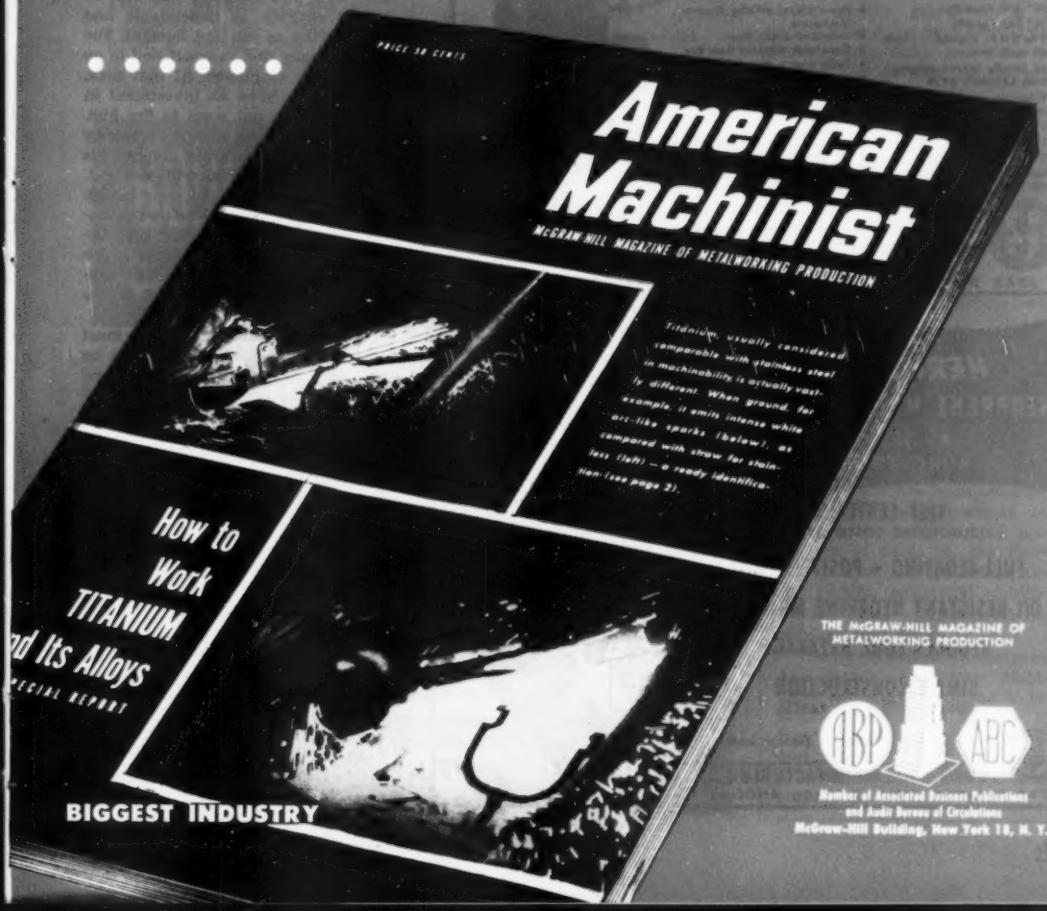

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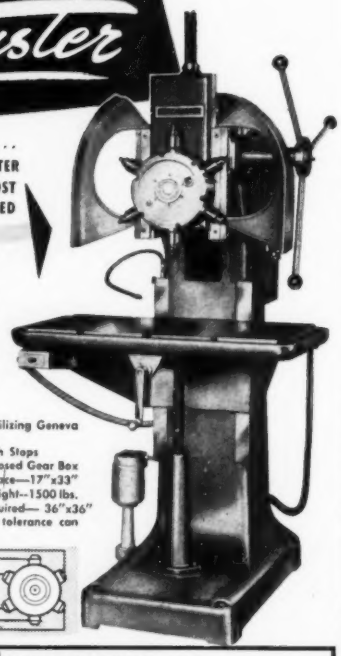

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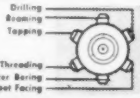

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ROUND TABLE Discussion

SOUR NOTE?

SOME PROBLEMS that face supervising personnel are difficult to manage. The question of money and friends often becomes a straining point in business. It seems impossible to mix business and personal feelings and ever have results that are not badly mangled when all of the smoke has blown away. The question of whether, as a friend, a supervisor should sign a note for one of his workers is really difficult to decide. However, from the practical side, the signing of a note is a practice that one should not become involved in too frequently.

Signing notes for your workers is a dangerous practice, even when they are your best friends. Too often things come up. Many times even though you have been friends with your employee and believe you know him well, you suddenly find that he is not entirely as dependable and trustworthy as you had thought. Too late you may find yourself tied to an undesirable employee. At that time, because you have an investment in him, you may not want to fire him. So you are in the middle. Someday higher management may demand his replacement and you will lose out. —both your money and your friendship. Perhaps you will be on the losing side even to the point that because you, also, did not do your job well and kept an unsatisfactory employee, you too are replaced. It is a dangerous situation.

Another factor which you must also weigh is—are you going to be able to handle the rest of your employees as you did this special case? Can you afford to do favors for all your workers? If you don't extend favors, are you strong enough to withhold all favors to your borrower and thereby prevent any friction? Remember that you are, as anyone should be, interested in protecting your own position and loan. Certainly, being a foreman, you can't afford to have the note go sour. You will try to prevent this. What will it lead to? Harry is no fool and he realizes that you will give additional concessions to protect your position. The other employees soon learn of this and then where are you? It is a difficult position and a difficult decision to make.

However, the old saying that fa-

Continued on p. 244

Subcontracting Requirements of Pittsburgh Primes Told at Clinic

PITTSBURGH—Almost 4000 small manufacturers' representatives in quest of subcontracts attended the Armed Forces Small Business Clinic here recently, sponsored by Pittsburgh Armed Forces Regional Council and the Chamber of Commerce of Pittsburgh. Forty-three prime contractors maintained booths at the Clinic, displaying samples of parts to be subcontracted and answering procurement and production questions posed by the visiting potential subcontractors.

Among prime contractors exhibiting at Pittsburgh, the following firms indicated items for which subcontractors are being sought:

***American Sterilizer* Co., Erie, Pa.**
Gaskets, metal, wire; castings, brass & bronze; lifts, cylindrical, elevator type; fittings, brass; plungers, cylindrical shaft; reflectors, aluminum, large; instrument trays, monel metal.

***Mackintosh Hemphill* Co., Pittsburgh**
Engine lathes, heavy duty; straighteners, rotary; mill, cold-strip, reversing.

***Bryant Heater Division*, Cleveland**
Castings and forgings, large, steel; housings, support, cast; heavy machining, from No. 4190 and 9850 steel; spindles, metallic; tank undercarriage, M-46 type.

***Ceco Steel Products Corp.*, Chicago**
Castings and forgings, small; transom clamps; hammers, manual, nonmetallic, various sizes; metallic pickets; pins, sway brace; pintles, large and small; metallic washers; ratchet wrenches, heavy metal.

***Dravo Corp.*, Pittsburgh**
Castings; shafts; crane wheels; screws and bolts. (Specialty shops on small quantity items are especially sought.)

***Joy Mfg. Co.*, Pittsburgh**
Aluminum castings; fans and component parts for aircraft impeller sections, small (3-in. x 1½-in. dia); castings, all types; turret lathe and boring mill work.

***LeJohn Mfg. Co.*, Huntington, W. Va.**
Machine parts, small (bushings, springs, bronze gears, fibre gears, metal and/or fiber races; fans, electric, small and component parts; knurled knobs of all sizes; bushings of various thicknesses and dia; plates, adapters; name plates, stamped and engraved.

***Kerotest Mfg. Co.*, Pittsburgh**
Component assembly, springs and shafts, small; gears, worm and helical, heavy and very heavy; name plates; plugs, drain and other purpose; valves, usually bronze, small.

***Lewis Foundry & Machine*, Ordnance Div., Pittsburgh**
Power brake, assemblies and sections; pinnion gear assembly; housings, sight, subassemblies; component parts, for gun and mounts; component parts, for tram blocks; rest head, assemblies; seat support.

***Scaife* Co., Oakmont, Pa.**
Automatic screw machine work; drop forgings.

(Continued next page)

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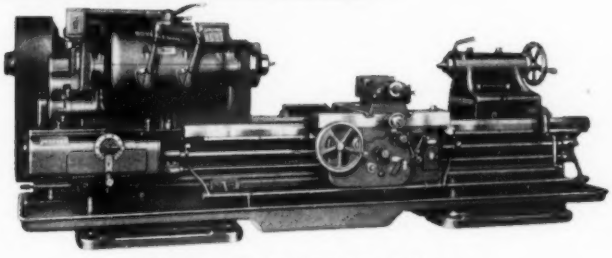

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Nevada Air Products to Make Subassemblies for Douglas

RENO, Nev.—The Nevada Air Products Co. has been awarded a $2½-million subcontract by Douglas Aircraft Co. for production of parts for the Navy Sky Raider. Nevada will make the rudder, horizontal stabilizers, and center-wing flaps for the carrier-based attack bomber.

The newly-organized company will occupy the former Mobihome site and is expected to be in production about January 1. Some $200,000 worth of tools and jigs for the plant have been ordered from the Sierra Machinery Co.

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Pittsburgh Clinic . . . cont.

Miller Equipment Co., Inc., **Franklin, Pa.**
Suppliers urgently needed for drop-forged buckles, adjusters, clips.

Miller Printing Machinery Co., **Pittsburgh**
Honing operations; milling, threading, some regular drilling; open capacity on Warner & Swasey No. 3A and 4A turret lathes.

Mine Safety Appliances Co., **Pittsburgh**
Cans and canisters, solid or grilled; cases, metal formed; sub-chassis work; stampings and moldings; valves, cast, small.

National Tube Co., **Pittsburgh**
Castings, die, zinc; drawings, wire, metallic; machine work, all sizes, from rough to precision; sheet-metal fabrication; stamping, metal.

Reliance Steel Products Co., **McKeesport, Pa.**
Machining and welding, steel; bridge floors; gratings.

Rockwell Mfg. Co., **Pittsburgh**
Hardware, metallic (springs, shafts, nuts of various sizes and purposes); meters, computing and component parts; pumps; oxygen regulator system; small stampings.

Siltronic Co., **Pittsburgh**
Castings, aluminum, precision; plating, zinc, anodyzing and die seal chromate; special devices, communications and electronic; stampings, metal.

Skinner Engine Co., **Erie, Pa.**
Bodies and housings, valve, steam; boxes, crank; cams, engine, steam; engines and component parts, diesel, heavy; valves, poppet, steam, small (5 in.-6 in.).

Superior Valve & Fittings Co., **Pittsburgh**
Automatic screw machine products; stampings.

Sylvania Electric Products, Inc., **Emporium, Pa.**
Automatic screw machine products; stamping, metallic, small; wire drawing.

Thompson Products Co., Tapco Div., **Cleveland**
Impellers, booster pump; shafts for turbine pumps, machined; small parts; drain plugs; gears; adapters; rings, oil-seal, metallic; rings, compressor, nut; valves, relief, poppet.

General Motors Needs Subcontractors For F-84E Jet-Assembly Project

KANSAS CITY, Kan.—Subcontracting sources are currently being sought by the Buick, Oldsmobile, Pontiac Assembly Divisions, General Motors Corp., in connection with their production of Republic's F-84E for the US Air Force.

GMC advises that subcontracts will be placed only with manufacturers able to furnish complete units, systems, or assemblies. Subcontracts will not be considered for integral-component parts or sub-subassemblies. There will be additional subcontract requirements for small mechanical and electrical assemblies for wing and forward fuselage sections, as soon as product engineering information becomes available.

• **Subcontract sources** are needed for the following components: tail pipe; ailerons; flaps; slats; canopy; pilot seat; bomb pylon; Jato tanks; rocket adapters; oil tanks; universal pylon; bomb adapter and sway brace; nose-drag strut and lock; engine accessories and air intake.

Pneumatic-gun assembly; fuel-system pipes, caps, valves; power controls-quadrant; lubrication-system fittings; instruments-tubing and fittings; hydraulic system-various purchased parts; armament provisions—ammo boxes, feed and ejector, chutes, armor plate, pneumatic-gun chargers, and rocket launchers; nose landing gear-doors and fairing; main landing gear-doors, uplock and downlock; flight-oxygen system; air-conditioning system; and emergency accommodations-fire detectors.

Further information is available from Mr. C. C. Brandon, director of purchasing and subcontracting, Kansas City Plant, Kanas City Kansas.

Chrysler's New Plant to Make P&W Jet-Engine Parts

INDIANAPOLIS, Ind.—Production of jet-aircraft engine parts will be undertaken at the new Chrysler Corp. plant. Construction of the plant is about 85% completed.

The plant here will produce components for the Pratt & Whitney J-48 Turbo-Wasp engine Chrysler's building for the Navy at another new plant north of Detroit.

The parts job will occupy about 200,000 sq ft of the Indianapolis plant area, the remaining space will produce civilian-automotive parts. Tooling orders for the defense job are now being placed and installation will start as soon as the manufacturing building is ready.

Twin Disc Gets Navy Contract

RACINE, Wisc.—Twin Disc Clutch Co. has been awarded a $1½-million contract to make miscellaneous repair parts for diesel engines for the U. S. Navy.

Twin Disc, which has plants in Racine and Rockford, Ill. will use the local plant for Navy production. The branch plant is now in production on contracts for Army ordnance and the Air Force. The company is making spare units and parts for Army combat vehicles, and transmission equipment for AF ground equipment.

Lockheed To Build Aircraft Test Facilities

BURBANK, Calif.—Lockheed Aircraft Corp. will build and equip a $12½ million aircraft assembly plant for the Air Force at Palmdale, northeast of Los Angeles.

President Robert E. Gross of Lockheed said that the new desert facility would be used for final assembly and test flying of the company's jet planes.

Gross said that he did not expect actual assembly operations to get under way for about two years.

Fairchild Licensed To Build French Gas-Turbine Power Plant

FARMINGDALE, N. Y.—Exclusive rights in the U. S. for the manufacture and sale of a French gas-turbine auxiliary power plant, the Oredon, have been obtained by the Stratos Div., Fairchild Engine & Aircraft Corp.

Built by Societe Turbomeca, the unit delivers 140-shaft hp for operation of accessories. At sea level conditions it can drive a 60-kw generator with 150% overload. Possible uses include small-ship propulsion or as a high-speed pump drive.

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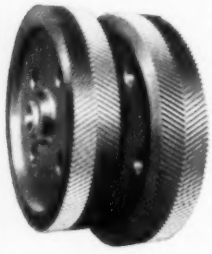

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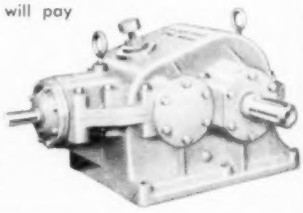

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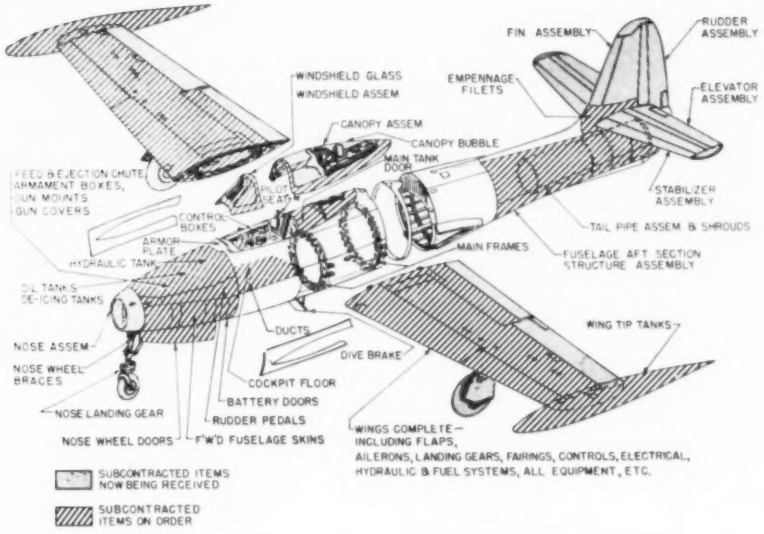

Republic Aviation Corp. shows breakdown of work being subcontracted on the Air Force's F84E jet fighter. General Motors is also building the plane at Kansas City, Kan. For story on GM's subcontractor needs, see page 237

Radio-TV Association To Spur Industry Subcontracting

NEW YORK—The Radio-Television Manufacturers Association recently set up within its organization a clearing house to bring prime contractors and subcontractors together to speed up delivery of electronic equipment to the Armed Forces.

Most of the prime contracts have gone to the large companies with World War II experience with the smaller manufacturers suffering because of poor sales of television and radio receivers and Government restrictions on critical materials. These producers must have new business in the form of electronic subcontracting to survive.

A survey of facilities and capabilities of the association's 329 member manufacturers (72% of whom are small business and prospective subcontractors) has just been completed. The survey was undertaken to provide a master list indicating just what prime contractors are in need of particular services and what prospective subcontractors can supply these services most quickly and efficiently.

Two or three contracts have been arranged and the association is confident that the process will be speeded up from now on.

Emergency AF Bid Requests Available To Local Firms

LOS ANGELES, Calif.—Emergency requests for manufacturers to bid on Air Force contracts are now available for inspection by area businessmen at the Small Business Office of the Western Air Procurement District. Previously the emergency-type request for bid was available only to those manufacturers on the AF bidders list at the Air Materiel Command in Dayton, Ohio.

This type of bid is authorized by the Congress during periods of national emergency and covers purchases that have to be delivered one or two months from the time the need for the material arises.

The Los Angeles Small Business Office is at 155 W. Washington Blvd.

LATEST DEFENSE CONTRACTS

ORDNANCE AWARDS

Tank-Automotive Center, Detroit

Thurman Machine Co., Columbus, Ohio—tank-automotive spare parts, $196,468.

Liquid Carbonic Corp., Chicago—machine-gun mounts, $154,194.

Kelsey-Hayes Wheels Co., Detroit—disc assembly, $104,723.

Metro Engineering & Mfg. Co., Inc., Detroit—van bodies, truck, 2 contracts.

Scintilla Magneto Div., Bendix Aviation Corp., Sidney, N. Y.—electrical connections, $119,256.

Joy Tool & Die Co., Garden City, Mich.—cam, heckle assembly, spare parts, $186,949.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.—master-junction boxes, spare parts, $200,000.

Berlin Chapman Co., Berlin, Wisc.—exhaust-housings and machine, $170,095.

Sparton Automotive Div., Sparks-Withington Co., Jackson, Mich. — head-lamp assembly, $125,008.

Diamond T Motor Co., Chicago—motor vehicle parts, $105,722.

Kenworth Motor Truck Corp., Seattle, Wash.—motor vehicle parts, $172,287.

International Harvester Co., Washington—stake trucks, exceeds $250,000.

R & E Tool & Guage Co., Detroit—road-wheel spacers, $169,267.

Trailmobile Co., Cincinnati — cargo semi-trailer, $140,800.

Detroit Ordnance District

Rett Products Co., Detroit—tank-automotive spare parts.

Canfield Tool & Die Co., Detroit—tank-automotive spare parts.

SIGNAL CORPS AWARDS

Philadelphia Procurement Agency

Boonton Radio Corp., Boonton, N. J.—test sets, exceeds $250,000.

Pacific Electronics, Los Gatos, Calif.—maintenance kits, $184,507.

Western Electric Co., Inc., New York—cable switchboards, cable, $137,157.

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NAVY AWARDS

Bureau of Ships, Washington 25, D. C.

Packard Motor Car Co., Detroit—diesel engines, exceeds $250,000.

Bettendorf Co., Bettendorf, Iowa—cutters, minesweepers, $106,869.

Ships Parts Control Center, Mechanicsburg, Pa.

Westinghouse Electric Co., Philadelphia—circuit breakers, repair parts, $128,890.

Hercules Motors Corp., Canton, Ohio—repair parts for diesel engines, $249,018.

Bureau of Ordance, Washington, D. C.

Beatrice Steel Tank Co., Beatrice, Neb.—powder tanks, exceeds $250,000.

Package Machinery Co., E. Longmeadow, Mass.—machine tools, $141,042.

Hunter Mfg. Co., Bristol, Pa.—plant equipment, loading, exceeds $250,000.

McCord Corp., Detroit—machine tools, rocket, exceeds $250,000.

Lion Mfg., Co., Chicago—fuzes, exceeds $250,000.

General Electric Co., Washington, D. C.—synchros transmitters, receivers and capacitors, exceeds $250,000, 2 contracts.

Flour City Ornamental Iron Co., Minneapolis, Minn.—mine anchors, exceeds $250,000.

Norris Thermodor Corp., Los Angeles, Calif.—cartridge cases, exceeds $250,000.

Naval Construction Battalion Center, Porthueneme, Calif.

Barber & Greene Co., Aurora, Ill.—ditching machines, $129,396.

Parsons Co., Newton, Iowa—ditching machines, exceeds $250,000.

Bucyrus Erie Co., S. Milwaukee, Wisc.—spare parts, exceeds $250,000.

Harnischfeger Corp., Milwaukee—crane components, $122,817.

Davey Compressor Co., Kent, Ohio—air compressors, $129,200.

Gar Wood Industries, Inc., Findlay, Ohio—ditching machine, $135,540.

Rome Grader Corp., Rome, N. Y. — road graders, exceeds $250,000, 2 contracts.

C. V. Hill & Co., Trenton, N. J.—equipment, exceeds $250,000.

Four Wheel Drive Pacific Co., Los Angeles, Calif.—clamshell buckets, exceeds $250,000.

Thew Shovel Co., Lorain, Ohio—spare parts, exceeds $250,000.

Foote Co., Nunda, N. Y.—concrete paver, exceeds $250,000.

Snook Rotary Snow Plow Co., Windom, Minn.—snow plow, exceeds $250,000.

Klauer Mfg. Co., Dubuque, Iowa—snow plow, exceeds $250,000.

Wm. Bros Boiler & Mfg. Co., Minneapolis, Minn.—snow plow, exceeds $250,000.

Bay City Shovels, Inc., Bay City, Mich.—cranes, exceeds $250,000.

NAVY AVIATION AWARDS

Aviation Supply Office, Philadelphia

Reynolds Metal Co., Louisville, Ky.—ingots, aluminum-alloy, $181,381, 2 contracts.

Boston Woven Hose & Rubber Co., Boston—welding and cutting hose, $100,936.

Stratos Div., Farmingdale, N. Y.—maintenance items, exceeds $250,000.

AIR FORCE AWARDS

Air Materiel Command, Wright-Patterson AF Base, Dayton

Bell Aircraft Co., Niagara Falls, N. Y.—bomb tails, exceeds $250,000, guided missiles, exceeds $250,000, facilities, exceeds $250,000.

AIR FORCE AWARDS . . . cont.

Westinghouse Electric Co., Dayton,—automatic pilots, exceeds $250,000, machinery and equipment, exceeds $250,000.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.—generators, exceeds $250,000, torque-pressure indicators, direct-cranking starters, exceeds $250,000, generators, exceeds $250,000.

Jack & Heintz Precision Ind., Cleveland—generators, exceeds $250,000, 2 contracts.

North American Aviation, Inc., Los Angeles, Calif.—assemblies, exceeds $250,000.

U. S. Gauge Div., American Machine & Metals Inc., Sellerville, Pa.—transmitters, exceeds $250,000, 2 contracts torque-pressure gages hydraulic-pressure gages, manifold-pressure gages.

Boeing Airplane Co., Seattle, Wash.—spare parts, exceeds $250,000, gas turbine div., exceeds $250,000, 2 contracts, machinery and equipment, exceeds $250,000.

Harry A. Lowther Co., Inc., Shelbyville, Ind.—towing vehicles, exceeds $250,000.

Loewy Construction Co., New York—pressure stations, exceeds $250,000.

Lockheed Aircraft Co., Palmdale, Calif.—aircraft, 2 contracts each exceeds $250,000, training sets exceeds $250,000.

Hydro-Aire, Inc., Burbank, Calif.—airplane components, exceeds $250,000.

Hotpoint, Inc., Chicago—turbo-superchargers, exceeds $250,000.

Sunstrand Machine Tool Co., Rockford, Ill.—constant-speed drives, exceeds $250,000.

Waltham Watch Co., Waltham, Mass. — gyro-vertical indicators, exceeds $250,000.

Aro Equipment Co., Bryan, Ohio—oxygen equipment, $175,043.

Petro-Chem Development Co., Inc., New York—air heaters, $169,507.

Ronan & Kunzl, Marshall, Mich.—liquid-oxygen storage and transfer tanks, $193,000.

Bill Jack Scientific Instruments Co., Solano Beach, Calif. — vertical-gyro indicators, $100,000.

Delco Products Div., GMC., Dayton—facilities, exceeds $250,000.

Thompson Products, Inc., Cleveland—engine components, 3 contracts, each exceeding $250,000.

Whirlpool Corp., St. Joseph, Mo.—aircraft components, $179,000.

Fairchild Engine & Airplane Co., Valley Stream, N. Y.—J-47 components, aircraft components, 2 contracts each exceed $250,000.

Wyman-Gordon Co., Worcester, Mass.—aircraft forgings, exceeds $250,000.

Steel Products Engineering Co., Springfield, Ohio—aircraft components, $235,000.

General Electric Co., Lockland, Ohio—engines, exceeds $250,000.

Wright Aeronautical Div., Curtiss-Wright Corp., Woodridge, N. J. — engines, exceeds $250,000, spare parts and tools, exceeds $250,000.

Buick Motor Div., GMC, Flint, Mich.—machinery and equipment, exceeds $250,000.

General Electric Co., Lynn, Mass.—fuel storage and transfer, exceeds $250,000.

Taylor Forge & Pipe Works, Chicago—aircraft forgings, exceeds $250,000.

International Harvester Co., Chicago—aircraft wheels and brakes, exceeds $250,000.

Western Electric Co., New York — radar system, exceeds $250,000.

General Motors Corp., Rochester, N. Y. — machinery and equipment, exceeds $250,000.

Saginaw Steering Gear Div., GMC, Saginaw, Mich. — machinery and equipment, exceeds $250,000.

Consolidated-Vultee Aircraft Corp., San Diego, Calif.—machinery and equipment, exceeds $250,000.

Republic Aviation Corp., Farmingdale, N. Y.—machinery and equipment, exceeds $250,000.

Ford Motor Co., Dearborn, Mich.—B-47 wing sets, exceeds $250,000.

Leland Electric Co., Dayton—inverters, exceeds $250,000.

Douglas Aircraft Co., Inc., Santa Monica, Calif.—aircraft spare parts, exceeds $250,000.

Robertshaw-Fulton Controls Co., Greensburg, Pa.—airspeed indicators, $100,000.

Heintz Mfg. Co., Philadelphia—J-47 subassemblies, $214,000.

RCA Victor Div., RCA, Camden, N. J.—shoran radar equipment, $200,000.

by
GARRISON
COMPLETE
GEAR CHUCK
SERVICE

Garrison Gear Chuck Service starts with your gear print and follows through with a complete service for the life of the chuck. Over thirty years of experience in designing and manufacturing pitch line control gear chucks exclusively, has built up a wealth of engineering knowledge. This knowledge is applied to designing the best custom-built gear chucks for solving your gear problems.

✓ For detailed information as to equipment and price, mail us your gear prints marked to show the operation to be performed and the machine or machines used.

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MACHINE WORKS, INC.
DAYTON 4, OHIO

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- **THE TOOL ROOM!**
- **THE MACHINE SHOP!**
- **THE PRODUCTION LINE!**
- **HEAVY MANUFACTURING!**

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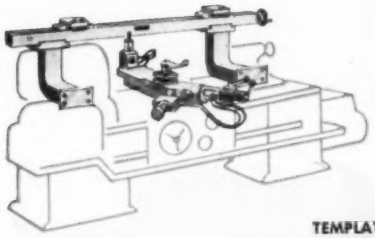
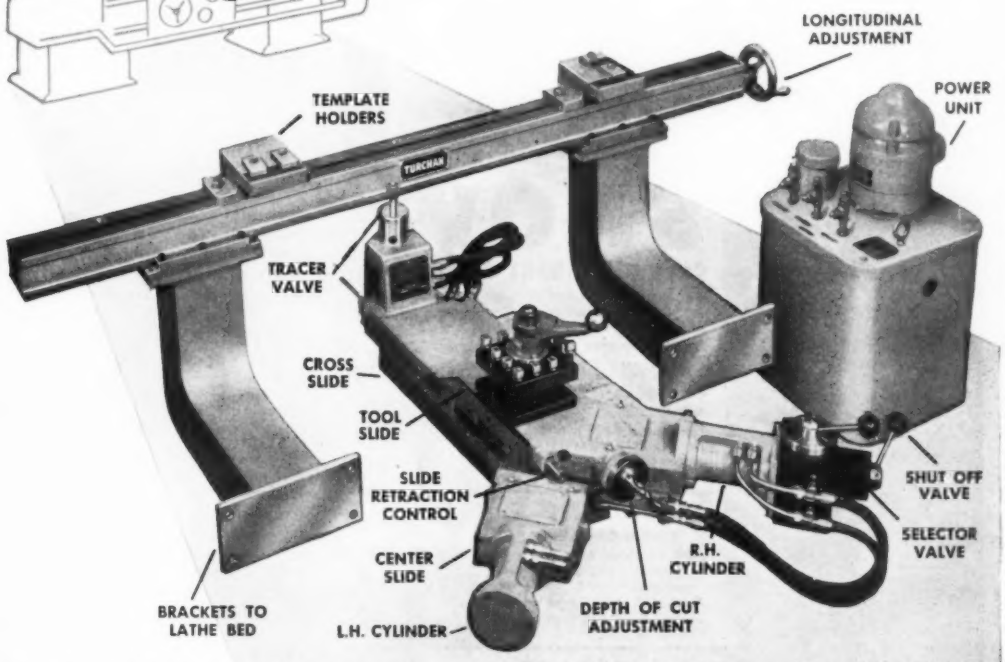
KO INDUSTRIAL IMPORTERS

Greatest advance in turning since the invention of the metal working lathe!

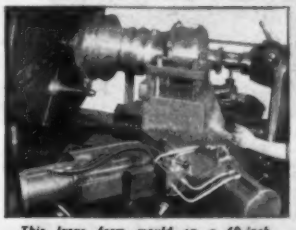


Turchan hydraulic dual duplicator gives 4 to 6 times faster production



Just add this Turchan dual-turning hydraulic duplicator to your standard lathes and watch costs go down! No more need for expensive special form tools. No skilled help required. Job set-up time is cut to a small fraction of old way. A cross slide equipped with two compounds at 45° to center line and 90° to each other replaces the conventional arrangement, allowing a new combination of movements. The 45° compound movements are controlled through a tracer, guided by template or full size model, while the cross and longitudinal travels are obtained with the regular lead screws.

This *DOUBLES* tool approach to the work, greatly extending use of the machine tool. Only one slide at a time is controlled by the tracer. Machining of right or left square shoulders, bevels, tapers, steps, undercuts, radii and contour facing is easily accomplished. All this at faster speeds, and greater accuracies (to .001".) Size of work is limited only to capacity of the lathe. There are other Turchan Follower attachments for milling machines, planers, shapers and grinders. "Turn to Turchan to cut costs." Send for folder.



This large form mould on a 60-inch lathe was turned 4 times faster by Turchan dual control than by former method. A tough job made simple!

WRITE US TODAY: Send a sketch and specifications of any job. Give make of machine. We'll show you how to produce it better, faster, at lower cost.

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OLDEST MANUFACTURER OF HYDRAULIC ATTACHMENTS FOR MACHINE TOOLS

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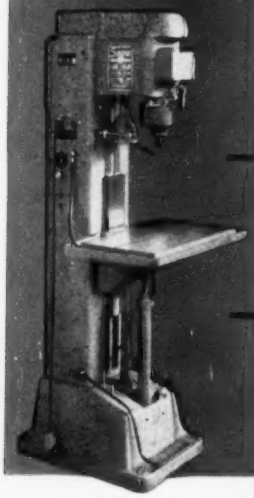
SO MANY ADVANTAGES for HIGHEST PRODUCTION

4800 PER HOUR!
3800 PER HOUR!
2500 PER HOUR!

For Top Production



SNOW

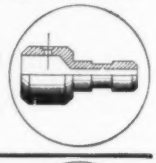
FULL UNIVERSAL MACHINES

Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING

Crossdrill and C'T" Sink 1/16" Hole

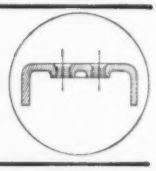
Material—Brass
Production—4800 per hour
Fixture—#15 Vertical index
Equipment—#1-UD Drilling Machine



TAPPING

Tap Two #10-32 Holes

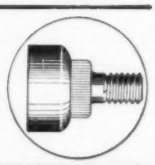
Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine



THREADING

3/8"—24 Thread—1/2" Long

Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

SNOW

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Submit Sample Parts for Production & Cost Estimates

miliarity breeds contempt is one that should be thought about. First, why should a supervisor be especially close friends with his workers? Is it good business psychology to intermingle outside the plant with the men whom you supervise during the day? Isn't it wiser to keep such relationships to a minimum and if possible only intermingle intimately at company gatherings? If you have close friends working for you, are you able to hold these friendships and do your job as it should be done? The answer is "no." It is impossible for a supervisor to judge squarely and impartially those who are his close friends. He makes allowances, he becomes unfair to other employees and therefore leaves the door wide open to criticism from top management.

It is far better to pick your own friends in the same class of work. Class distinction? Yes. Democratic? Perhaps not, when viewed in the light of our socialistic trends. Yet, from a practical business standpoint it is the only way we can grow and become more industrialized and maintain our high standard of living.

A rule that all supervisors should follow whether they be president or foreman: Never let personal affairs enter into business. It results in chaotic conditions which sometimes end only with the destruction of the entire company. No, not necessarily the complete failure of business but it certainly results in a reduction of business to the point where the company is no longer a growing organization but remains small and unprogressive.

Ed, don't sign your job away.

Charles D. Townsend
West Hartford 7, Conn.

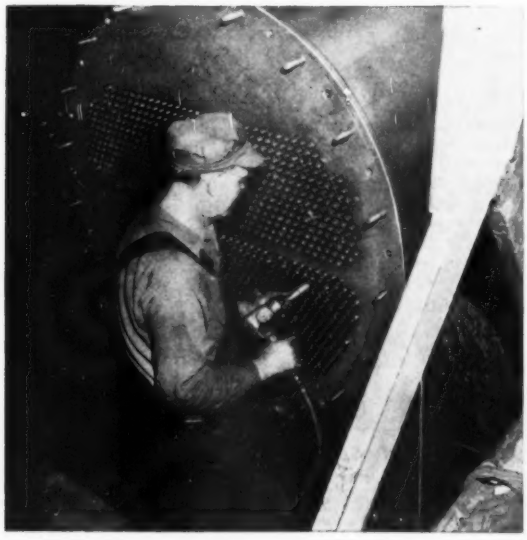
•

IN THE CASE of a foreman who was asked to back a note for a loan to one of his workers, the foreman would have only himself to blame if the loan later became a bad debt and he had to assume the liability for its repayment as a guarantor. Even though the worker happens to be a good friend of the foreman and a good mechanic, these factors should have no bearing on the necessity of the foreman being obligated to sign a worker's note. Personal affairs and shop relations should be kept separate. It is bad business to mix the two.

It is not the foreman's business to become involved in doing personal favors for his men. As long as the worker performs efficiently, his status as a company worker engaged on company business should govern the extent of the foreman's responsi-

CP-3440 AIR IMPACT WRENCH

saving 60% of nut-running time



The packing nuts of this condenser are being run to uniform tightness because of the power regulator of the CP-3440 REVERSIBLE AIR IMPACT WRENCH. This control of tightness also adapts the CP-3440 for assembly line work anywhere.

On this particular job the CP-3440 is saving approximately 60% of the time required when a T hand wrench was used — and operator fatigue is eliminated.

Less than six inches long, the CP-3440 works where longer tools cannot be used, and weighs but 4½ pounds.

The complete line of CP AIR IMPACT WRENCHES meets every demand for tightening or removing nuts and bolts, driving and removing wood and lag screws, driving and removing studs, and for tapping, in all kinds of maintenance work. *Write for Bulletin 812.*

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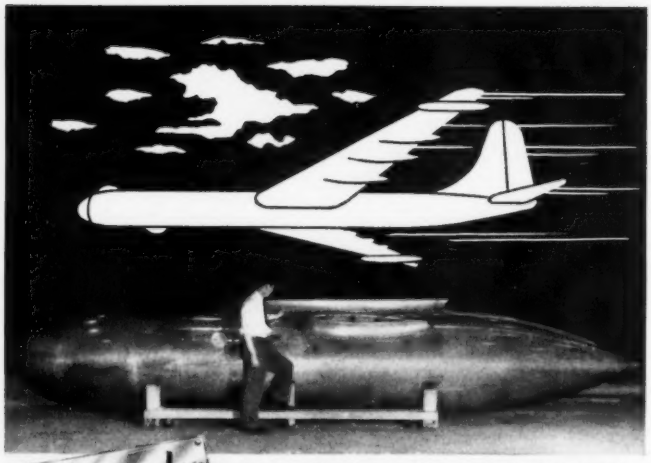

Federal RESISTANCE WELDERS USED IN CONSTRUCTION OF LARGEST KNOWN FUEL TANK

The huge external aircraft fuel tank pictured above is one of a type being produced for the Air Forces by the Ryan Aeronautical Company. Designed by Ryan the tanks are fabricated of aluminum alloys, seam welded to MIL-W-6860 (AN-W-30) on Federal Welders where Ryan is making gas-tight seams without the use of sealing compounds.

Federal Resistance Welding equipment enables Ryan to produce a smoothly streamlined tank that has no external riveting or protuberances to disturb the aerodynamic flow over the skin. Too, resistance welding the tanks eliminates added weight.

High production is another important factor and Ryan, like other aircraft and automotive manufacturers, finds Federal Resistance Welders the most efficient method for producing quality assemblies at high speeds.

The latest Federal Three-Phase Aircraft Spot Welder for welding stainless, aluminum, nickel alloys and carbon steels. If you are interested in Three-Phase Resistance Welding be sure to talk with the Federal Representative in your area. There's a reason why Federal is First in Resistance Welding. Send for your copy of the latest Federal Three-Phase Bulletin.

THE FEDERAL MACHINE & WELDER CO.
WARREN, OHIO

Federal® WELDERS
Warco PRESSES®

bility. He is not the keeper of his worker's personal problems.

Shop business is like oil. It won't mix with anything but shop business. It certainly won't mix with personal affairs. A foreman cannot do a personal favor for one worker without starting an unfortunate precedent for future trouble. It follows then that the foreman steps outside the sphere of his duties when he tries to mix a worker's personal business with his value to the company as a good worker. The foreman cannot afford to treat one man any differently than he treats others, friend or not. To do so smacks of favoritism. Perhaps one of the most demoralizing habits of an inept foreman is having a favorite around the shop. It is a very natural, human trait to show particular interest in or do a personal favor for a subordinate who comes from the same neighborhood or belongs to the same lodge, but it can cause trouble in any shop. In a shop, nothing between a foreman and an employee is personal. Anything a foreman does in the shop or away from it will affect the running of the shop. Doing a personal favor for one employee will cause the rest of the workers not in the inner circle of favor to feel insecure and discouraged. They are apt to say resentfully of the foreman's recipient of personal favors, "He knows where the body is buried."

The worker's personal affairs should not be forced upon the foreman. The foreman is only interested in the proper utilization of the man as one of a group of workers. The man's personal business is his own. Company business should be entirely separate from personal business. Shop relations that take into consideration the worker's knowledge, experience and ability for the job is a more equitable form of relation-

"WHEN YOU GETTING YOUR NEW GLASSES, JIMSON?—YOU'RE READING THAT CRACK IN THE WALL AGAIN!"

Two Index and Location Boards, below, list Dayton Pump's general purpose tools; two others list and identify special tool, jigs and fixtures; Planning Boards beside them provide visible record of all tools drawn by each employee. Cabinet at the left contains complete records of all tools whether in crib or issued to operators. The entire unit produces the improvements and savings outlined below.

DAYTON PUMP benefits 10 WAYS

. . . quickly saved $12,957 with McCASKEY TOOL CONTROL

In the first three months of their use of McCaskey Tool Control, the Dayton Pump and Mfg. Co. reduced their tool expense $12,957 and attained the continuing results outlined below. Their experience provides additional proof that McCaskey installations start paying off immediately.

Specifically here are ten of the reasons why Dayton Pump is enthusiastic over its results, briefed from facts received from Mr. Louis Wozar, Vice Pres. and Assoc. Gen. Mgr.:

1. **Idle Tools Recovered** . . . up-to-the minute inventory of all special and standard tools, taken during McCaskey installation, revealed amazing quantity held in tool boxes and benches for occasional jobs . . . now available for daily requirements.

2. **Tool Inventory Reduced 20%** . . . by requiring operators to return tools not in use . . . by determining (1) proper inventory levels and (2) quantities to be purchased through reference to accurate tool usage and inventory records instead of guesswork.

3. **Less Tool Breakage** . . . McCaskey breakage report has made operators "tool conscious" and careful . . . indicates whether employee, method or operating conditions are responsible.

4. **Crib Performance More Efficient** . . . McCaskey Index and Location Boards, key to fast service to production, instantly provide tool number, description, size and location of all tools . . . for special tools, jigs and fixtures also show whether used on active or service parts . . . accurate, compact, easily read . . . also facilitate storage of more tools in less space.

5. **Arguments and Accusations Stopped, Productive Hours Increased** . . . tools are quickly and definitely located whether in operator's possession or in the crib . . . no delays for disputes or searching.

6. **Blueprints Quickly Located** . . . eliminates confusion and delay, when prints are recalled, and prevents occasional costly errors, involving man-hours and materials, from use of obsolete prints not turned in or found.

7. **Accurate Tool Usage Records** . . . now available for quick check-up on performance data and obsolescence.

8. **Perpetual Inventory** . . . accurate, up-to-the-minute record of available tools easily maintained by positive procedure.

9. **More Productive Time for Machines, Tools and Men** . . . thru faster service to job setters and production workers . . . no lost motions in tool crib . . . no dependence on attendants' memory . . . no laborious clerical work.

10. **Efficient Operation with Inexperienced Attendants** . . . new personnel quickly and easily trained to operate McCaskey Tool Control smoothly and efficiently.

These advantages produced big savings in the first months of operation. They point to continued savings month after month for Dayton Pump . . . and for you, too. Why not investigate NOW? Mail the coupon for step-by-step procedure and additional facts today.

THE McCASKEY REGISTER CO., ALLIANCE, OHIO

Send me complete information about McCaskey Tool Crib Control . . . procedure . . . user's reports . . . all the facts.

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50 Years Service to Industry
BARS • BEARINGS • BUSHINGS

ship than one which attempts to inject personal interests and personalities into the picture.

The best course to follow, when a worker asks his foreman to do him the personal favor of signing a note for him, would be to refer the man to the Personnel Department. This department in handling personnel welfare problems would be in a better position to help the worker in meeting his personal problems. A company loan to tide the worker over the emergency situation, and to be repaid out of earnings in installments to the company, could be arranged. The foreman has enough headaches and burdens in meeting production schedules without the added load of solving personal problems of his men. Undue strain on the foreman can be avoided if the worker's personal problems are referred to the Personnel Department for action.

Granting personal favors and displaying favoritism are sour notes. They are out of tune as applied to good foremanship, and can only disrupt the harmony of a smoothly functioning shop.

Harry Kaufman
Philadelphia, Pa.

•

ALICE IN BLUNDERLAND

IN AS MUCH AS sound business is no longer considered successful and enduring unless the employer and employees work as one team, it seems pretty obvious that the management-worker grievance committee is about as sound as one could imagine. A committee consisting of a man from the personnel department and the head of a department, to my way of thinking, is too one-sided. They are employer-conscious, naturally, as their positions in the manufacturing setup are basically representative of the employer. The success which they achieve is dependent upon the fulfillment of their obligation to work for the interests of the employer first, last, and always.

A grievance committee consisting of employer-minded men will naturally consider any grievance, or adjustment, from the employer's standpoint. This is not conducive to harmonious relations. This doesn't mean that their decisions will always be unfair to the man who registers a complaint, far from it. Most of the time you'll find that the man of executive caliber will weigh matters with that broadness of vision which led him to assume the responsibility of his office. There is an invaluable potential, however, so often lost

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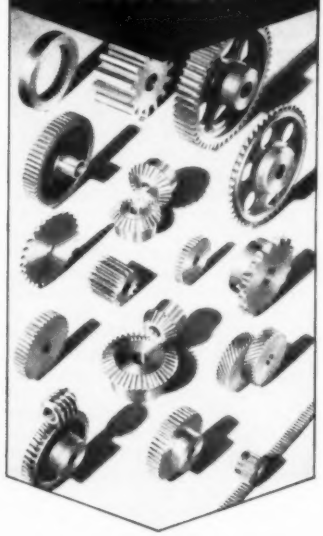
in a range of 48 to 3 diametral pitch

...are quickly available



Eliminate "high-cost-specials" by ordering your gears from the American Stock Gear catalog. Famous for high quality manufacture and dependable performance. These good gears are carried in stock by good distributors.

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division PERFECTION GEAR CO.

asg Harvey, Illinois

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This part finished 60% FASTER with a SUPER-SPACER

This spindle required the grinding, after hardening, of six equally spaced 1" holes. Formerly it was mounted in a V-block and holes were positioned by use of indicators and size blocks.

Production time was cut 60% when the same part was held in a Super-Spacer which provided precision indexing and instant hole location. Result, better, faster grinding at less cost per piece.

This production tool can help you, too! Write for information now.

Hartford Special also makes these production machines

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(Note to subscribers: If you have trouble hanging on to your copies of AMERICAN MACHINIST *because someone else grabs them, put a circle around this ad for a gentle hint.)*

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40 hours a month instead of 100! Yet, this 60% cut in packaging time is only part of the savings.

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*Reg. U. S. Pat. Off.
Vapor rust protective

Slushing took **15** minutes

Now **6** minutes does it with Angier VPI Wrap

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sight of in not taking the worker into the conference. It has a definite psychological influence upon the other workers who feel that they are a working part of the industrial machine. In selecting a worker representative one must be careful that he is a man of discerning mind, can take it on the chin when a discussion gets to the point where he is being backed to the wall. The one who is to look after the interest of the workers in the grievance session should be one who is well read on the economics of industrial operation so that he can see the interests of the employer as well as the welfare of the worker whom he represents.

Regardless as to how the grievance committee is formulated, it is my opinion that the worker should take any matter of complaint up with the foreman first and then, if he still feels that he is unfairly dealt with, resort to the grievance committee as a lost resort after discussing it with his worker representative. I mention the conference with the representative because so often trivial matters come up which should not reach the higher court—the representative should take matters in his own hand and do his best to convince the griper that he hasn't a leg to stand on or possibly he could urge him to modify his complaint somewhat. I know how I would feel if one of my men took up a matter with a grievance committee without discussing his grievance with me first, and you can bet your micrometer that the complainer would feel that the foreman had it in for him for some time to come. What's the matter with a shop committee to handle matters first so that the trouble can be weighed before referring it to the management-labor committee?

John Homewood
Ontario, Calif.

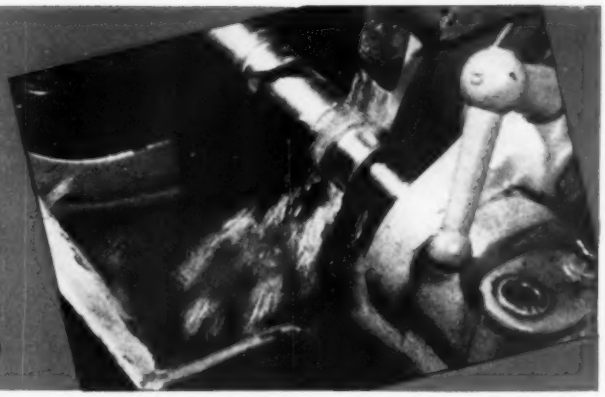
•

GOOD FOR EVIL

WE HAVE the problem: Does Ed have the right, moral or otherwise, to blackball a former employee's application for a better job with a rival firm? The answer is—No! He does not have the right. If he were a real man he wouldn't even think of trying to hurt Smedley's chances of getting another and better job.

No one man can please everybody. In this case, Smedley apparently decided that life wasn't worth living if he had to work for Ed; he quit, as he had a perfect right to do. The very fact that Ed didn't want him to quit is proof itself that

RESULTS...
never before realized with coolants... can be YOURS... with revolutionary
POWDER'D OIL



POWDER'D OIL for grinding used on precision external grinding of Carpenter Tool Steel in a Brown & Sharpe Cylindrical Grinder.

Photo . . . Courtesy of FEDERAL MACHINE & TOOL CO., Long Island City, N. Y.

Easily proved advantages mean BIG SAVINGS and BETTER WORK

Verdicts of those who have tried POWDER'D OIL add up to just this: here is a coolant that is definitely superior to old fashioned methods and which produces far better work at lower coolant costs.

Used for grinding, this free-flowing, specially compounded golden powder, when mixed with water, produces a clear light green solution which, in replacing soluble oils and chemicals:

. . . operates cooler because of its refrigerating properties (a feature which now, for the first time), can be definitely proved.

. . . assures cleaner grinding, longer wheel life and better finishes.

. . . enables operators to see their work because solution is clearly transparent.

. . . is easily handled and mixed, with no oil spillage, waste or danger of slippery floors.

. . . remains stable in solution and does not separate, assuring longer solution life and better rust protection.

. . . has a mild sweet odor and is free from rancidity, greasiness and gumminess; is safer and cleaner for men and machines.

In addition, POWDER'D OIL is shipped in fibre containers, rather than steel drums, saving shipping charges and eliminating return shipping costs of drums, as well as costly drum deposits.

POWDER'D OIL is also available for *cutting* with advantages already noted, plus increased tool life and production.

These facts suggest giving POWDER'D OIL an immediate trial. Prove for yourself on your own work the revolutionary features of this up-to-the-minute coolant by sending TODAY for a 50-lb. drum.

Read What Users Say

- "POWDER'D OIL is easier to handle than ordinary soluble oil, and the clear solution enables operators to see their work at all times."
  (A large Automotive Accessory manufacturer)
- "POWDER'D OIL keeps grinding wheels clean and free cutting, and the solution remains sweet."
  (A large Steel company)
- "POWDER'D OIL foams less and produces excellent finishes."
  (A large Firearms manufacturer)
- "We were pleasantly surprised with the excellent all around results obtained with POWDER'D OIL for grinding."
  (A large Saw manufacturer)

The Sanson Line of POWDER'D OILS for:

Grinding (General Purpose)	Stamping Non Ferrous Metals
Grinding Cast Iron	Dip Drawing
Grinding Aluminum	Wire Drawing
Cutting (General Purpose)	Rolling
Cutting Cast Iron	Honing
Cutting Aluminum	Burnishing
Stamping Steel	Rust Protection
	Fast Quenching

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Oils and Chemicals for Industry
Plants: Long Island City, N. Y.—Newark, N. J.—Philadelphia, Penna.

Gentlemen: Kindly send a 50# drum of POWDER'D OIL for
It is understood that I will be credited with the amount invoiced if I am not entirely satisfied with the results of my trial, and on receipt of return of the unused portion of the shipment.

Name

Position

Company

Address

(Please insert type of POWDER'D OIL desired)

don't scrap metal by turning!

...save by Swaging

on

The Torrington Rotary Swaging Machine uses every bit of stock. With 4000 hammer blows a minute, swaging reduces, sizes, rounds, tapers and points rod, wire and tubing. It makes metal tougher and more resilient. It hammers away minor surface defects.

Torrington Swagers are built to a mechanical perfection based on our 42 years' swaging experience. Send today for your free copy of the illustrated booklet describing the machine and the method.

THE TORRINGTON COMPANY
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Send the coupon today for your free copy of this booklet.

Please send a copy of "The Torrington Swaging Machine" to:

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Firm_____

Address_____

there was little wrong with Smedley's work. Ed's real trouble is the fact that he, the boss, was not smart enough to criticize Smedley in a way that Smedley could take. Ed had the authority; it was his job to handle Smedley, and he couldn't do it. It seems both of them lost their tempers.

Ed was the boss, and the boss lost his temper. It is illogical now for Ed to say that an employee of his, who lost his temper, will never make a good foreman. Ed doesn't know that for a fact.

Henry Ford had trouble working for various bosses, but he seems to have made a very good boss later on. Thousands of other men have been discharged as incorrigibles or quit their jobs because of incompatibility with supervisors, only to reach the heights on their next jobs.

Favorable recommendations from previous employers are not worth the paper they are written on. Disgusted employers will and do give favorable recommendations to unsatisfactory employees to get rid of them. I have done it myself many times, and do not consider it a reprehensible practice; it is merely a touch of the Golden Rule. Who is the employer so righteous, so just, so all-seeing that he can say that a man who didn't fit into his organization, will stand no chance in another organization of another type. I certainly will never say that.

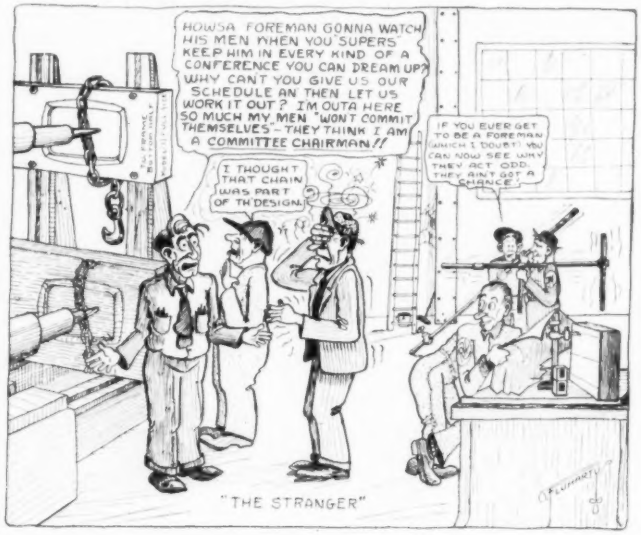
A personnel manager who judges men by the opinions of the man's last employers (and many do this) is not worthy of his job. That man would let his neighbor pick his wife for him. It's what a man does on the job for you that is important, not what he didn't do for his last boss that counts.

And yet there are many unqualified men who reach the spots where hiring is consummated who do not have the courage of their own convictions, nor the judgment to make decisions. And so every day the mails are full of letters begging for information on John Jones' personal habits, and with questionnaires other hopeful souls piously feel one should fill out for them. It seems something must be done about it.

At one time we had the right and the authority to get rid of a man who refused to play ball in our league by our rules. Today, the unions might or might not let us remove a man for cause. But unions or no unions, past or present, I'll never believe it is right to blackball a man's future—any man's future. When the man is outside the gates of our plant, I'll say he is entitled to be on his own, and it doesn't matter whether we put him there, or whether he weighed us in the balance, and found us wanting.

If Ed is real smart, and if he values his own soul, he'll sit down and write a letter. In that letter he'll say that Smedley left of his own accord, that he was damn sorry to see him go, and would be very glad to take him back. If he's a man, Ed will go a step further and he'll state that he knows no reason why Smedley wouldn't make a first-class foreman.

J. K. Matter
Detroit 5, Mich.


HOWSA FOREMAN GONNA WATCH HIS MEN WHEN YOU SUPERS KEEP HIM IN EVERY KIND OF A CONFERENCE YOU CAN DREAM UP? WHY CANT YOU GIVE US OUR SCHEDULE AN THEN LET US WORK IT OUT? IM OUTA HERE SO MUCH MY MEN WONT COMMIT THEMSELVES - THEY THINK I AM A COMMITTEE CHAIRMAN!!
I THOUGHT THAT CHAIN WAS PART OF TH'DESIGN
IF YOU EVER GET TO BE A FOREMAN (WHICH I DOUBT) YOU CAN NOW SEE WHY THEY ACT ODD. THEY AINT GOT A CHANCE!
"THE STRANGER"

A toolroom baby that's grown into a-

Production Giant!

Rivett 918 "Steelway" Turret Lathe

Now you can produce small duplicate parts speedily in unlimited quantities with precision known only to the toolroom!

For here's a lathe that's been developed out of the bench class into a production machine. It has all the inherent precision for which Rivett has long been famous, plus time-saving features that reduce set-up and cutting operations to a fraction of that normally required. Single part production can be powered and cycled automatically.

Any one of 120 to 3750 RPM cutting speeds may be instantly and accurately selected; newly designed collets increase speed of operation as well as accuracy and gripping power; automatic chuck closer and well grouped controls step up operator time.

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Drilling Large Holes from the Solid?

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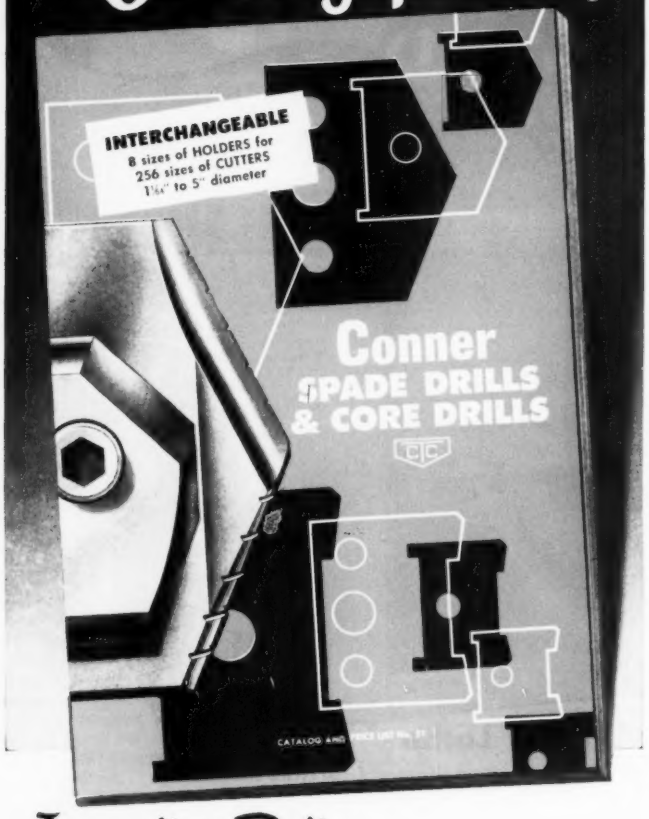

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TEA FOR TWO

THERE ARE probably two hundred or more firms in New York State where they either have a recess of ten to fifteen minutes or they have snack carts constantly moving about the different departments of the plant.

The recesses usually begin about ten o'clock in the morning and again at three in the afternoon.

Back during the days when we started to work at 7 in the morning, many times a man would remove the pie from his lunch kit, about ten o'clock, and eat it, so the idea of a recess or a snack cart follows an old-time act.

One firm has a regular schedule for the cart, so arranged that it gets to column 412 at 10.02, at column 418 at 10.14, etc., and the employees expect it on the minute for the cartman is very punctual.

On the cart are nearly one hundred items which may be purchased by employees at less than store prices, yet the firm makes a profit sufficient to pay the operator a good wage and also to pay any handling charge.

Every article is packaged in cellophane or other covering so it is not exposed to bare contact handling.

In some plants, the snack cart passes behind the machines and the men take the items they want to munch on while working. In this way, the men do not have to leave their work at all.

When discussing this idea with several managers (the last was on April 10, 1951) there has not been a single derogatory remark made about the idea of either the recesses twice a day or the snack carts.

Most of the heads of plants strongly favored the idea of allowing the men to have "a bite to eat" from time to time during the working hours.

One manager made a statement about as follows:

"Before we instituted our carts, in the shop, we made a study of the circumstances of many of our men and we found that the average time for them to get from home to the plant was about a half hour.

"As we begin work at 8 o'clock, it means that a man must leave home about 7.15 in order to avoid missing a bus or trolley car; this, in turn, means that he must breakfast about 7 AM, hence, he must arise soon after 6 o'clock.

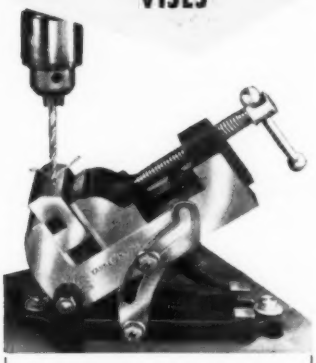
"Now the doctors tell us that the human stomach empties itself in about three hours and that a man's energy begins to lessen soon after such a period.

"The old theory that a stomach

Jig in a Jiffy

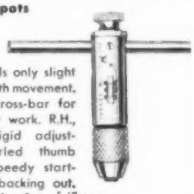
"YANKEE"

ANGLE VISES



Easily converted to fast-acting, economical jig. Shortcuts costs on small jobs. Lock the work in the "Yankee" Angle Vise. Tilt for the angle and lock. You're set up for every operation . . . hand or machine. Also available with quick-release swivel base. Two jaw widths . . . 2" and $2\frac{3}{4}$". Each vise supplied with grooved "V" Block for holding rounds.

"Yankee" Ratchet Tap Wrenches for tight spots



Ratchet needs only slight back and forth movement. Adjustable cross-bar for close-quarter work. R.H., L.H. and rigid adjustments. Knurled thumb piece for speedy starting in and backing out. Two lengths for 0 to $\frac{5}{8}$" taps, one for 0 to $\frac{3}{8}$" taps.

Write For "Yankee" Tool Book

NORTH BROS. MFG. CO.
Philadelphia 33, Pa.

"YANKEE" TOOLS NOW PART OF
STANLEY
THE TOOL BOX OF THE WORLD

Say... I'm Really Proud of that Production Record

Versatile Kempsmith Milling Machine Proves Ideal for Long Production Runs

You'll find the new Kempsmith LH Miller gives you a rugged, lightweight machine that combines simple, rigid construction with maximum flexibility. It enables you to attain your production goals on such jobs as small end milling, high speed jig boring, keywaying, oil grooving, light straddle milling, etc. Designed by experienced Kempsmith Engineers . . . men who have met the milling machine requirements of industry for more than 60 years. Write for your copy of Bulletin No. 127 describing this versatile machine.

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KEMPSMITH LH MILLER

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HIGH in Accuracy and Rigidity

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A Precision Tool that Holds Work at Any Desired Angle.

Puts Speed and Profit into Angular Drilling, Milling, Planing, Shaping, Grinding

With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

Made in several stock sizes.

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40 ARBORETUM ROAD · BOSTON 31, MASSACHUSETTS

A better Lathe
from any angle.
(1) "Zero Precision" Tapered Roller Bearings—the best Timkens on any lathe. (2) Large collet capacity with Choice of Center Diameters. (3) Hobcut gears throughout for smooth operation. (4) Modern full double wall apron. (5) Bed has an engineered backbone. (6) Two V-belts to spindle for greater pulling power. (7) Holds precise accuracy for years.

By whatever standards you measure a lathe—bearings[1], capacity[2], gearing[3], apron[4], bed[5], power to spindle[6], accuracy[7]—whatever is important to you, you will find it completely satisfied in a SHELDON lathe.

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SHELDON MACHINE CO., Inc., 4234 N. Knox Ave., Chicago 41, Ill.

needs rest has been exploded. It can rest while the owner is asleep.

"Our men are allowed ten minutes to rest and refresh themselves at 10.00 AM and at 3 PM and we have not lost anything in the way of production, and, in some departments, there has been slight improvements.

"We are of the opinion that a bit of relaxation is a good thing."

The day of wage slavery is past and Ed had better wake up to modern usages and plant deportment.

F. H. Stebbins
Worcester, N. Y.

•

BOSS-MADE ECLIPSE

THE PROBLEM of deciding whom to advance within an organization is certainly not an easy one to solve in many instances. The supervisor who is confronted with the job of making the decision can only weigh the evidence which he has at hand. Too often the man or men being examined and weighed against each other have certain qualifications or lack of qualifications that are not apparent in a casual view. Therefore, without knowledge of these factors a choice of a man is often pure guesswork.

What are the factors? First to be considered is the attendance record. This does not usually lead to any elimination. Yet sometimes the analyzation does give an indication. Perhaps one man has been out only two days while the other fellow hasn't missed a day. Why was this man off? Sickness, family reasons or just "off"? These reasons must be considered and weighed.

The next consideration must be the man's attitude toward his job and toward the company. His ability to do his present job and how does this ability tie into the requirements for the new position.

Age enters the picture only to a minor degree. If the man is young, is he mature enough to hold the new position? Has he proved that he is level-headed and a straight thinker?

Frequently the factor that is missing in men who have been on the job many years is the indication of their desire to get ahead. Are they content with things as they are or are they looking for better ways to do their job? Are they improving themselves or are they just drifting? A man must indicate that he is ready for a transfer to a better position in order to obtain one. A worker who is content to accept everything just as it is and who never tries to improve his work and who is never willing to do more than is required of him, will probably never be promoted.

YESTERDAY'S PIONEER • • • TODAY'S LEADER

WELDON

DOUBLE-END END MILLS

offer definite superiorities

YES, Weldon Double-End End Mills have all these advantages. In addition they give you double the service for less than the cost of two single-end end mills of equal size. They save production time too, because when you want to change the mill you need only turn it end for end.

- LESS BREAKAGE
- UNIFORM HARDNESS
- UNIFORM SIZE
- UNIFORM CLEARANCE
- TRUE RUNNING
- CLEAN CUTS

Weldon Distributors throughout U.S.A. and Canada carry complete stocks to serve you.

THE WELDON TOOL CO. Cleveland 4, Ohio
3000 WOODHILL ROAD

CLEVELAND *lead screw*
tapping machines

300 PIECES PER HOUR

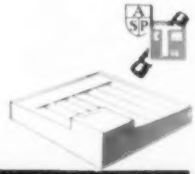
BOTH SIDES TAPPED IN ONE OPERATION

For a leading appliance manufacturer Cleveland engineers designed a Cleveland Tapping Machine to tap four 10-24 and one 6-32 holes in the top face of the main casting and five 10-24 and two 8-32 holes in the bottom face . . . both sides simultaneously all with lead screw controlled spindles to assure complete accuracy. On needed civilian and on defense jobs Cleveland Tappers are reducing production costs and saving priceless man hours. With a Cleveland Tapper engineered to the job, a semi-skilled worker becomes a skilled operator.

Mr. Lead Screw says . . . Write for your copy of the Cleveland Production Tapping Guide and a copy of Catalog AM-6

CHECK WITH CLEVELAND FIRST

If you need to perform any or all of these operations: Tapping...Threading . . . Drilling . . . Spot-facing . . . Reaming . . . Chamfering. Cleveland engineers can help you with your problem, show you how to effect economies in these operations.



THE CLEVELAND TAPPING MACHINE CO.
A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.
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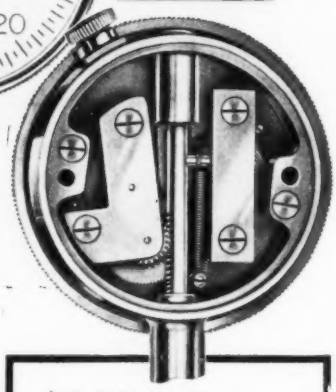
Modern Design SPEEDS PRODUCTION

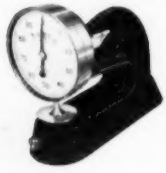


● Ames micrometer dial indicators are the most modern available today —and naturally so because Ames policy for over 50 years has been continually to improve design, to take advantage of new materials and to utilize the most advanced manufacturing methods. They are a real aid to the quality control engineer who is trying to keep pace with today's high production schedules.

Because Ames Indicators are functionally designed, they have fewer parts than ordinary indicators. Construction is simple with functional parts being larger and more rugged and adequately supported. Operational friction is at a minimum. Thus, Ames Indicators combine extreme sensitivity and accuracy with the ability and endurance *to stay right on the job longer.*

√ Check this list of features . . .

1 Forged Solid Brass Case and Stem
2 Heavy Brass Plate
3 Coarse Pitch Stainless Steel Rack
4 Hardened and Burnished Steel Pivots
5 Dials Printed from Steel Engravings
6 Patented Bezel Assembly



The failure of workers to think along the lines of this factor have many times kept good men in low positions. If a supervisor has no indication that the man has the "get up and go" he is not willing to rest his decision on seniority. The future of a company depends upon having men properly chosen for the proper jobs. Men who want to see improvement and who are willing to work toward that goal.

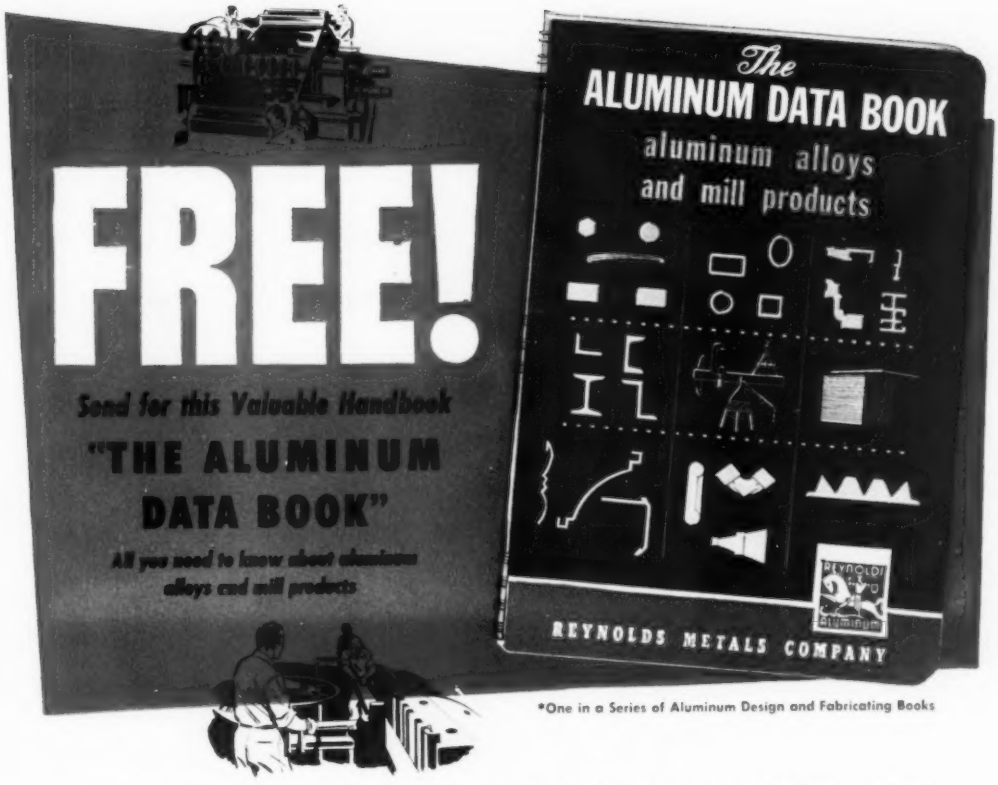
The man best qualified is the one who has shown he has the ability to accept greater responsibility and has the background required to fill the new position. The chance to succeed should never be used as a guide in selecting men. If each employe within an organization is not thinking about advancement and not working toward it, then placing him in a better job will not create that desire.

So to all supervisors from top level down to the foremen, remember the choice of men for better positions must be based on merit and ability to get a job done and not on seniority, family relationships or friendships.

Remember this, supervisors, you also are being judged by your supervisor in the same manner. Don't miss this all-important point of showing your own desire to get ahead. Do your job to the best of your own ability and a little better. As you judge your men so will you be judged. Always have someone trained and ready to step into your job. No advancement can take place without a replacement. The more important the job the more critical this specific condition becomes.

Charles D. Townsend
West Hartford, Conn.

"We're testing guards on the personnel instead of the machines."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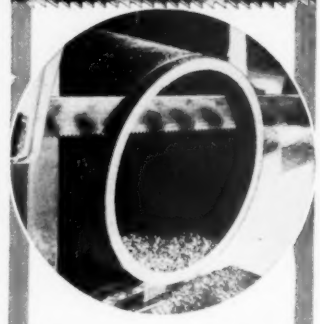
WAVY SET
BAND SAW BLADES
CLEARS AS IT CUTS



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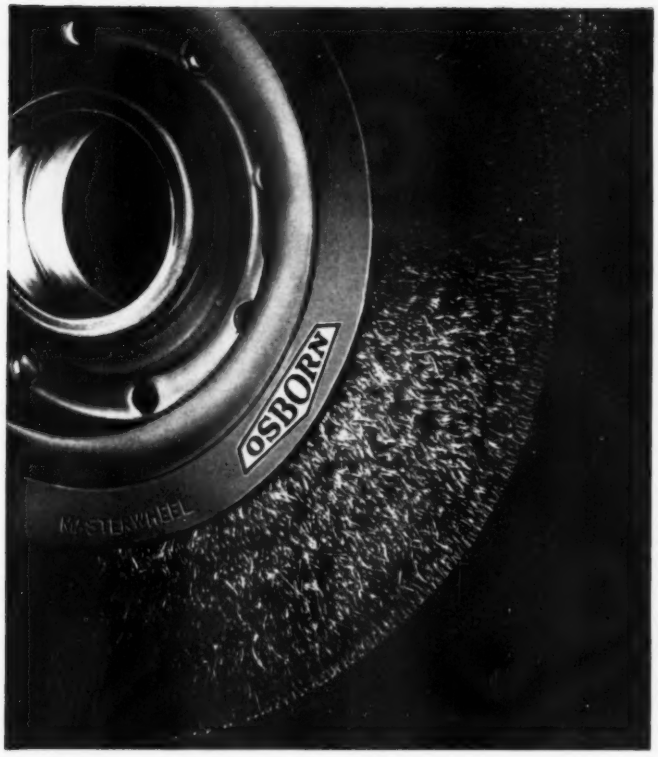

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Thousands of plants are discovering how to lick manpower problems with new Osborn Brushing techniques. Let's find out how they can help *you!*

Machine-powered Osborn brushes are removing burrs from threads and other parts 3 to 10 times faster than former hand methods. They are doing product cleaning, finishing and many other operations in a matter of seconds. They release skilled manpower for other work and cut rejects to the minimum.

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OSBORN

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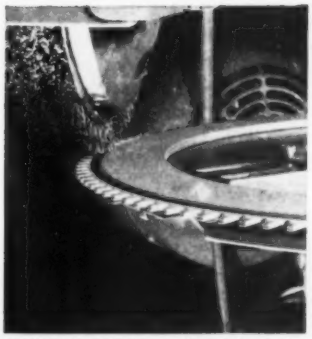
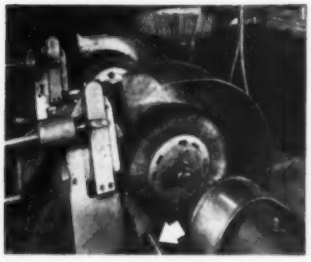


DEBURRING OUTPUT TRIPLED. That's the production increase in this plant using Osborn Power Brushing for the removal of burrs from clutch discs. And quality of finish is greatly improved.

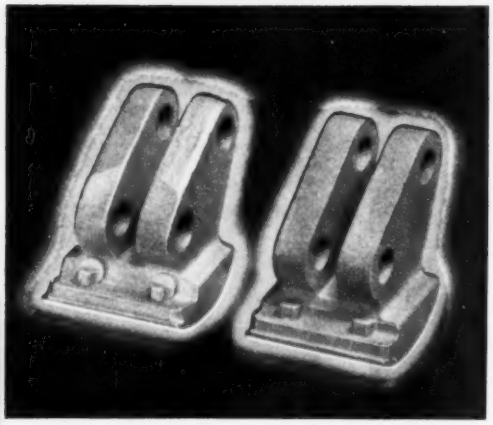


FINISHING OUTPUT UP 20%. Osborn Power Brushing removes heat-treat discolorations and surface imperfections of these shafts prior to plating. Cut number of passes from two to one, increasing output 20%.

THIS IS "OSBORN". Our engineers . . . in the field and at the factory . . . have a vast fund of experience to help solve your cleaning and finishing problems. When you buy brushes with the name "OSBORN" you can be sure you are getting tools for unsurpassed production *results!*

See New Osborn Brushes and Methods at National Metal Exposition. Detroit—Oct. 15-19—Booth D 118

Which one is investment cast?



They may look alike but the part at left was machined from a tool steel forging and cost 36% more to produce than the tool steel investment casting at right.

Tolerances
as close as ±.002" were maintained on this casting and were equivalent to the machined tolerances.

Tensile strength tests
showed no loss in strength from replacing the forging with tool steel casting.

Investment casting
proves economical by eliminating machining, handling of raw materials, service failures and spoilage.

Investment casting
results in substantial economies in producing metal parts of all kinds, especially those whose intricate design or material used make it impossible or costly to machine.

ENGINEERED PRECISION CASTINGS

For a guide to important savings, send for our informative brochure "Cost Reduction thru Investment Castings"

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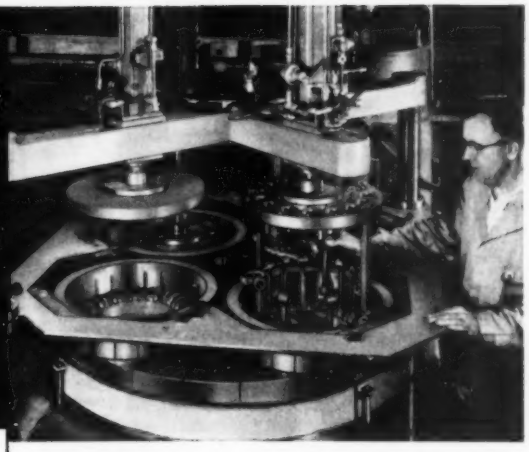
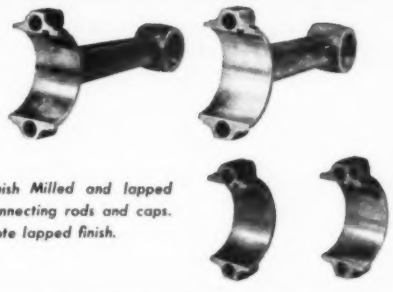
From Finish Milling To a Lapped Finish and Flatness of 1 Light Band (.0000116") At the Rate of

612 CONNECTING RODS AND CAPS PER HOUR





Finish Milled and lapped connecting rods and caps. Note lapped finish.

This is an unusual Lapmaster installation for two reasons. Production is high and the parts are not generally lapped. The reason for this is that the shape of the part makes it impractical to lap except on a Lapmaster. The Lapmaster handles 30 connecting rods and 30 caps per load. It takes but one minute to lap these down to a flatness of one light band. No polishing is necessary and grinding is eliminated entirely. Note that two conditioning rings are used for caps and two for the rods.

Lapmaster Handles Different Parts in One Cycle or Large Quantities of Same Part in One Cycle

The Lapmaster is an amazingly versatile machine, capable of generating surfaces of precision flatness and finish in short runs or in high production quantities. It handles a wide range of parts and materials such as monel, steel, bronze, cast iron, quartz, ceramics, etc. In one cycle the Lapmaster can precision-lap either identical parts or parts of dissimilar shapes and materials.

Improve Your Product With Precision Lapped Surfaces - - - With No Sacrifice in Production

Where accuracy of flatness and finish are important in product performance, the Lapmaster becomes one of the most important pieces of equipment in the plant. It is no longer necessary to forego the advantages lapping can bring to your product, (from a performance or cost standpoint) due to production requirements. There's a Lapmaster to fit your job . . . regardless of size of parts or production requirements.

Investigate This New Lapping Machine and Method

NOW!

A study of this 16 page booklet will reveal new possibilities for you in lapping precision and production. Actual production figures are given on five different size Lapmasters as well as the machine design features and specifications of this outstanding machine. **Write for it today.** Address your request to Dept. No. 1.

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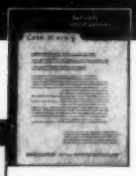
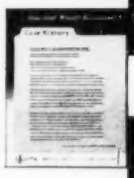
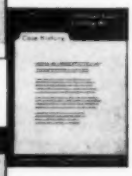


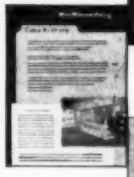
Soluble Oil Coolant →
☐ Case Histories: Ford Motor Company and Milwaukee Gas Specialty Co.



Chip and Waste Removal →
☐ Case Histories: Manufacturer of Fine Automobiles and Minneapolis Electric Castings Company. (Houdaille Conveyor Systems.)



Machine Tool Cutting Oil →
☐ Case History: Wagner Electric Corp., St. Louis.



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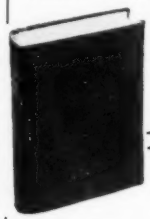

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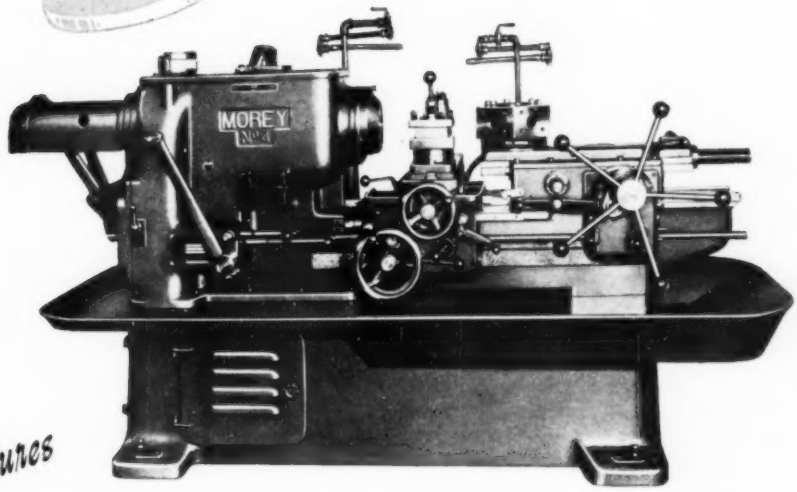

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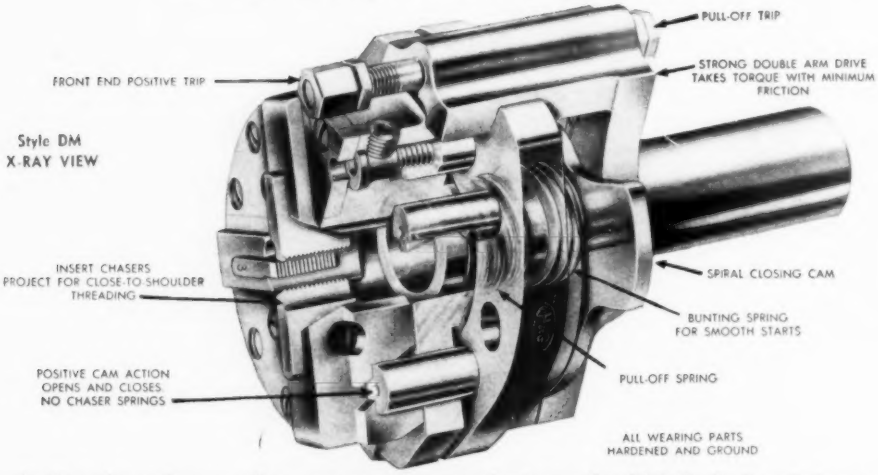
for new high threading speeds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STRONG DOUBLE ARM DRIVE TAKES TORQUE WITH MINIMUM FRICTION
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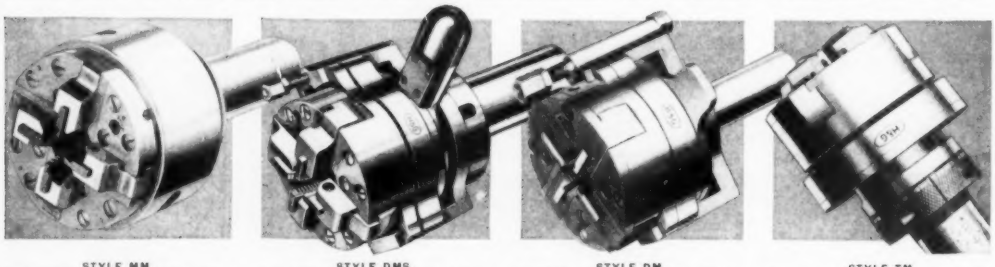
SIZES AND STYLES FOR ALL TYPES OF MACHINES ON WHICH THREADS ARE CUT



STYLE MM
For threading on multiple spindle automatics, viz.: Gridley, National Acme, New Britain, Cone, Greenlee, Davenport; any machine that ROTATES the die head—chucking machines, bolt threaders, drill presses, etc.

STYLE DMS
For cutting threads on turret lathes, hand screw machines and similar type machines which ROTATE the workpiece, holding the die head STATIONARY.

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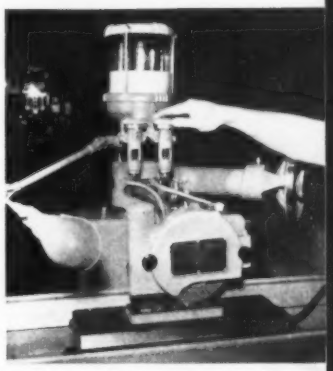
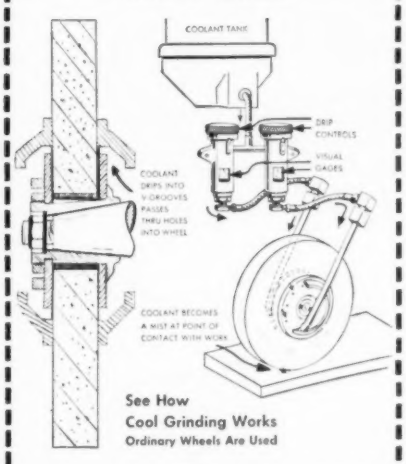
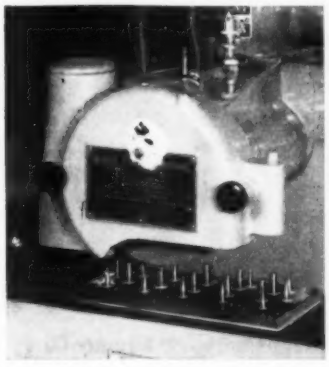


The coolant is metered to flow into and through the wheel.

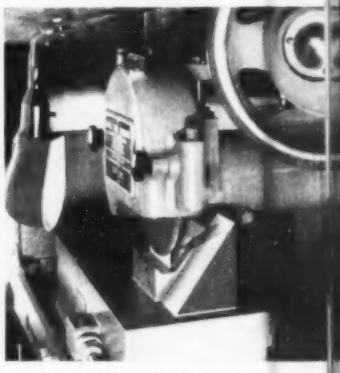
HOW IT WORKS


COOLANT TANK
DRIP CONTROLS
VISUAL GAGES
COOLANT DRIPS INTO V-GROOVES PASSES THRU HOLES INTO WHEEL
COOLANT BECOMES A MIST AT POINT OF CONTACT WITH WORK

See How
Cool Grinding Works
Ordinary Wheels Are Used



Grinding piercing dies—a tough job done faster, better by "COOL GRINDING."



Full visibility of wheel and work —a big benefit in form grinding.

IN DoALL "COOL GRINDING" coolant flows *through* the wheel and atomizes at the point of work. Every cutting particle is surrounded by coolant. *Standard wheels are used.* The results are spectacular. Big time and labor savings, greater precision, longer life between tool grinds are just a few of the benefits. There is a complete line of DoALL Precision Grinders with "COOL GRINDING" for every toolroom and production job. Ask to have a DEMONSTRATION of one of these grinders in your own plant.

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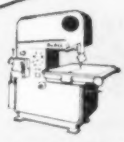

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from 4 kw to 30 kw

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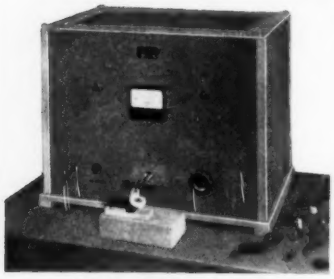

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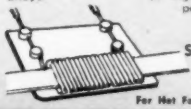

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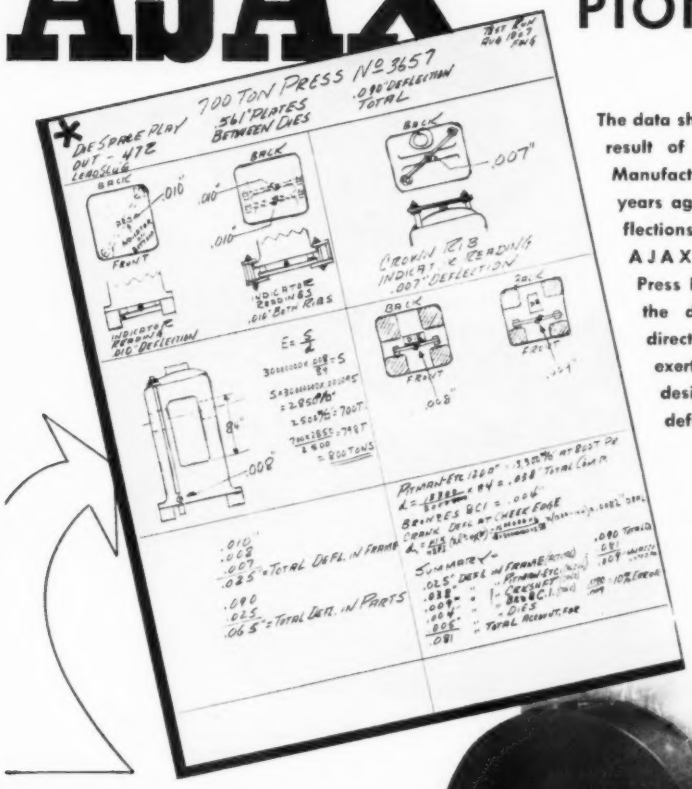
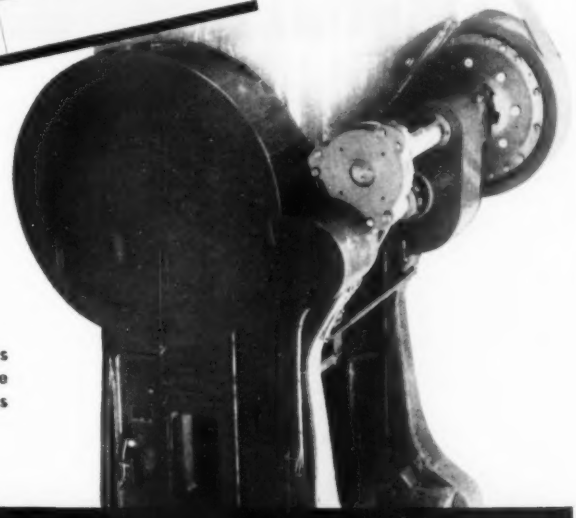


This old sketch of a press frame shows the use of a dial indicator and guage rod to read the elongation of the frame under load, which is a direct function of the tonnage exerted.

The data sheet on the left shows the original result of a test performed at the Ajax Manufacturing Co. plant in 1937, fourteen years ago. Here are the readings of deflections at different locations on an AJAX seven-hundred ton Forging Press Frame. This method of reading the deflections of a Press Frame directly to determine the tonnage exerted, enabled our engineers to design frames for a minimum deflection at critical locations.

Illustrated Below

2000 ton AJAX Solid Frame Forging Press Equipped with Disc Brake, Built in 1937



Fourteen Years Ago . . .

A two-thousand ton Ajax Forging Press equipped with a disc brake, believed to be the first of its type, used on a Forging Press

Built by **AJAX**

THE Ajax MANUFACTURING COMPANY

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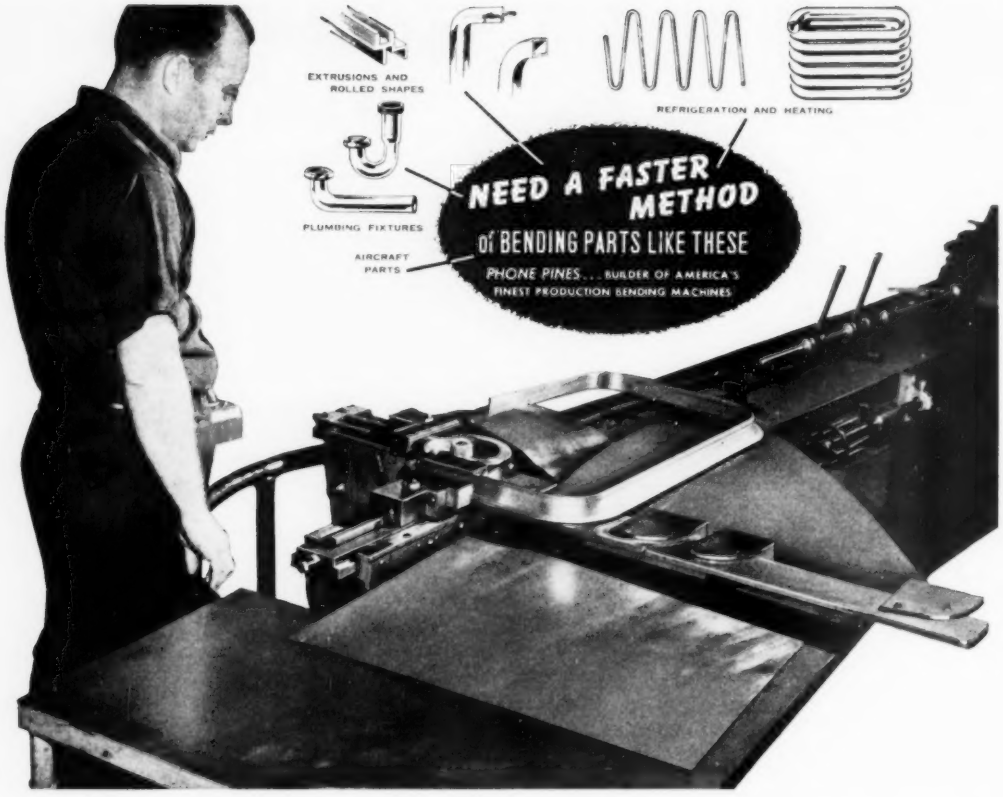
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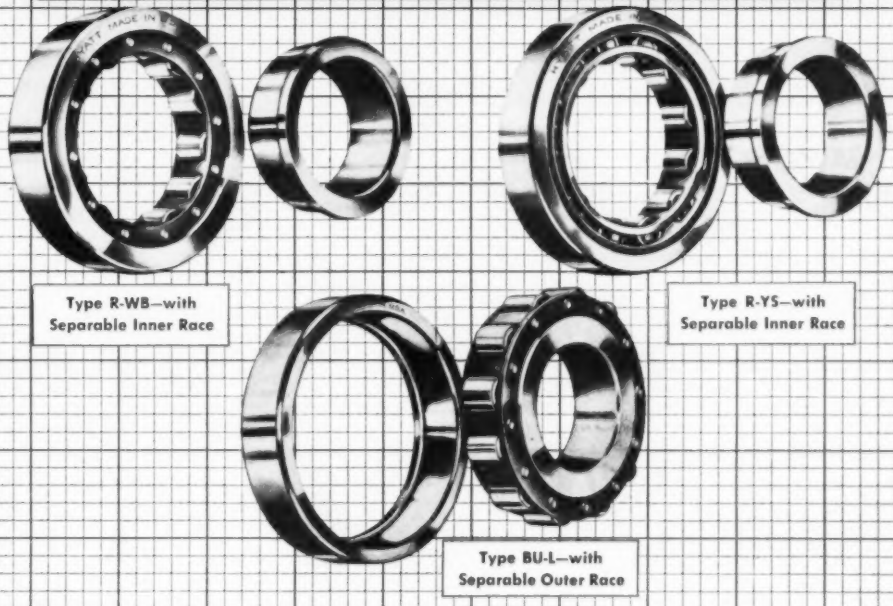

Type R-WB—with Separable Inner Race

Type R-YS—with Separable Inner Race

Type BU-L—with Separable Outer Race

Designed for innumerable applications where the bearing load is primarily radial, Hyatt Hy-Load Roller Bearings can also provide for axial shaft location. When they are used in pairs they can locate the shaft in both directions.

The flanged race construction of the types of Hy-Load Bearings shown here makes this important advantage possible. Other advantages for the designer that are provided in the Hy-Load line are: option of omitted race operation, complete interchangeability of parts, maximum capacity for standard dimensions, ten different types in a wide range of sizes — along with long, trouble-free life.

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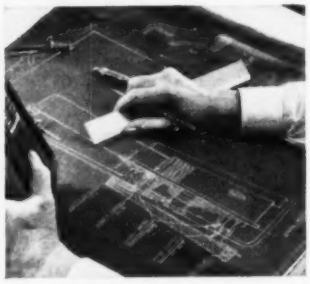
The surest way to realize the full economies inherent in the die casting process is *early* consultation with a competent die casting engineer—*before the design has advanced so far that changes are impossible or impractical.* Any die casting company will be glad to have an engineer help you in adapting the design of a part to its most economical production by the die casting process.



VISIT BOOTH A 162 AT THE METAL SHOW

USE OUR BOOKLETS . . .

To help prospective die casting purchasers, The New Jersey Zinc Company has prepared booklets giving up-to-date information on ZINC Die Castings. These booklets cover alloys, design, machining, finishing and applications. We will be glad to send copies of any of these booklets to you—or they may be obtained through any die casting company.

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Each year The New Jersey Zinc Company, on behalf of the die casting industry, assembles a comprehensive exhibit of ZINC Die Castings at the National Metal Exposition. If you are planning to attend this year's Exposition in Detroit—October 15 to 19—be sure to visit with us in Booth A 162 (Building "A"). Here is your opportunity to see many examples of the best in die casting design and to learn—first hand—how to get the most for your ZINC Die Casting dollar!

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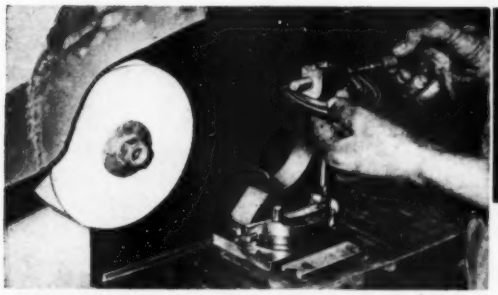
HOW A J & S "*Fluidmotion*"* WHEEL DRESSER *cut production costs*

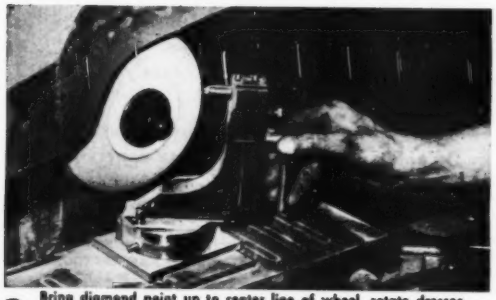
FOR THE ADAMAS CARBIDE CORPORATION

Paul C. Boniti, Shaping and Forming Supervisor of the Adamas Carbide Corporation, Harrison, N. J., reports that his standard Model "E" J & S "Fluidmotion" Wheel Dresser has



1 To set-up for convex radius, first mike distance from diamond point to micrometer plate, then add radius desired. (For concave radius, subtract).

2 Slide dresser in dust-proof channel till mike slips over pins as shown and lock with socket wrench. Dresser is now ready for action.



3 Bring diamond point up to center line of wheel, rotate dresser on swivel base in one continuous motion. A clean, accurate radius results! No chatter marks.

OTHER "Machine Shop TIME SAVERS" by J & S

J & S "All-Purpose" Jaw Clamps, KOALA Circular Cutting Tool, "Down-Hold" Vise Jaws, and "Attachable" Parallels. Write for "Time Savers" Booklet.

- **Cut set-up time**
- **Cut dressing time**
  (save on diamond and wheels)
- **Cut maintenance cost**
  In 4½ years grinding presintered carbide has cost $17.50 to maintain — less than $4.00 per year

HOW "Fluidmotion" saves time is demonstrated at left. Photos taken at Adams Carbide show how a concave or convex radius—accurate to .0001" can be obtained in three **simple** steps.

Dressing two angles **tangent** to a radius **is simple.** Only one more step is necessary. After radius is set (steps 1 and 2) the dresser is swung on its graduated base to first one angle, then the other, and both are locked in with a turn of the knurled knob. Actual dressing is again accomplished in **one continuous motion—it is not necessary to move the dresser on dove tails to form the angles.**

It is **important** in our work to have a rigid dresser that can dress a wheel **true consistently,** leave no chatter marks, **and still not have the abrasive content in the presintered material affect the accuracy of the dresser.** This I can personally vouch for. J & S "Fluidmotion" in **4½ years** has passed this test. I have complete confidence in "Fluidmotion"—no trial and error in order to obtain accurate forms. Our company has enjoyed the lower production cost made possible by "Fluidmotion's" repeated accuracy and ruggedness. It's **a cinch** to do our grinding jobs.

Adamas Carbide, well known for its **high quality, low cost carbide blanks,** attributes a fair share of its success in attaining more efficient production to its J & S "Fluidmotion" Wheel Dresser.

You, too, can also cut production costs by employing the J & S "Fluidmotion" Dresser in your tool room.

Application to any **surface or cylindrical grinder** is quick, simple. Set-up and dressing time is yet the lowest to be found.

Wheel Dressers made to dress wheels accurately up to 36" in diameter, and designed to meet your grinding requirements.

*Reg. U. S. Pat. Off. *For details, write to:*

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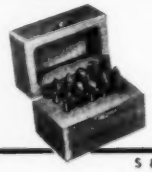

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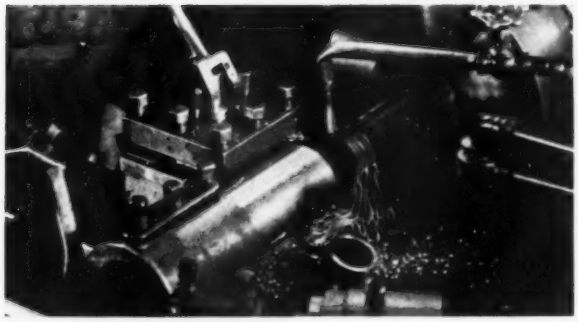

REMOVES CUTTING COMPOUNDS... After machining and before inspection, shafts are thoroughly and rapidly degreased. The same degreasing equipment is also used to clean rough metal stock before it is put on the lathe.

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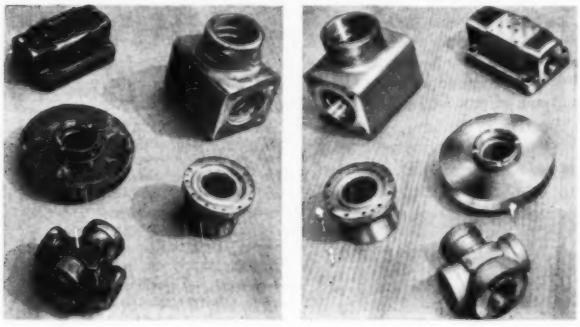

Metals are cleaned . . . quickly . . . when you use vapor degreasing with Du Pont Trichlorethylene. It reaches into deep holes and other inaccessible places to dissolve grease and oil—often in less than a minute.

Vapor degreasing helps cut down rejects. *All* the grease and oil, plus loose metal filings, rust and abrasives, are removed . . . with less handling of delicate parts. Work comes out of the degreaser clean and dry, immediately ready for the next step.

Companies in all phases of metalworking use this fast, safe, efficient process. Plants expanding production or doing metal cleaning for the first time find vapor degreasing especially applicable.

You can obtain vapor-degreasing equipment of almost any capacity . . . for manual or conveyorized operations. And it can be easily installed at any step in your production sequence. Get the facts today by sending the coupon below.

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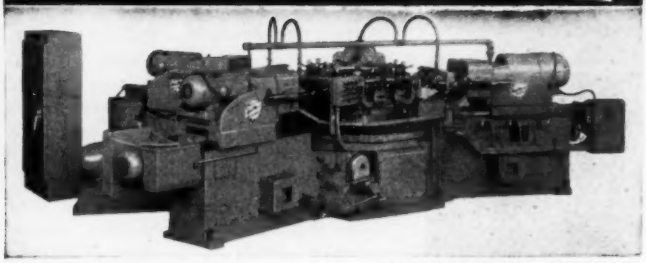

Station Type Indexing Machine for drilling and reaming king pin holes.

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
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5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

4 New Davis & Thompson Mechanical Power Heads

Included in the design of this machine are the new ROTO-MATIC Mechanical Electrical Power Heads operated through screw feed. An important safety feature of these units is the patented overload release clutches on the feed. Because of the simplicity of their design the units require a minimum of servicing.

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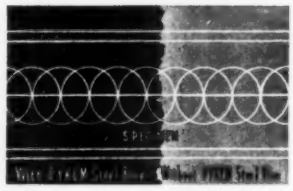

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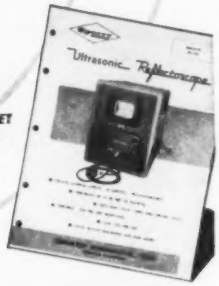

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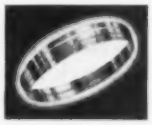

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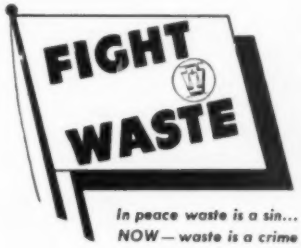

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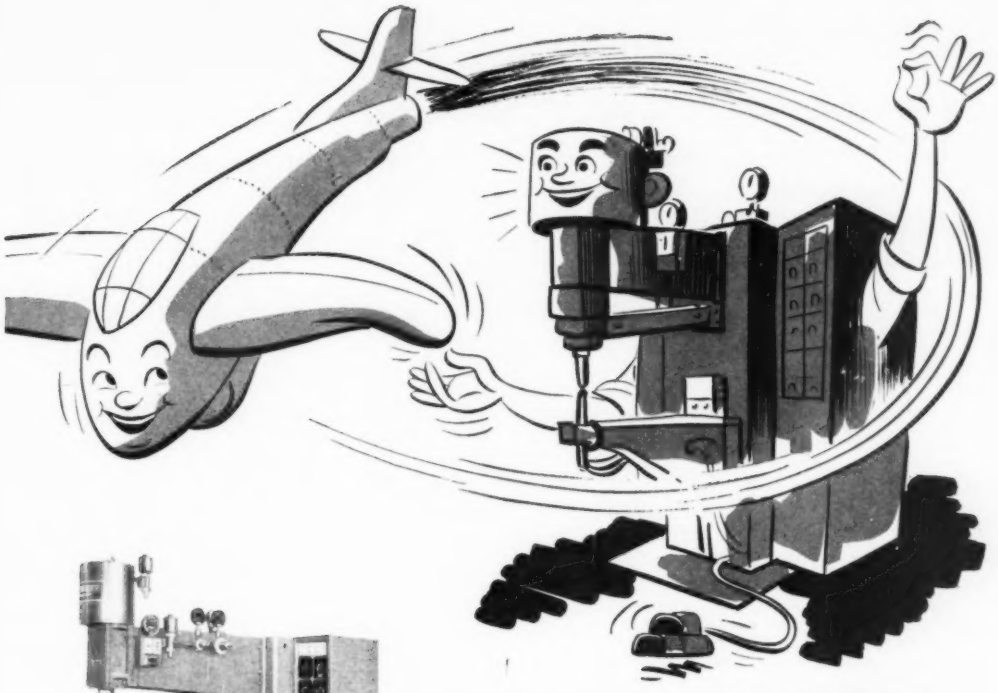

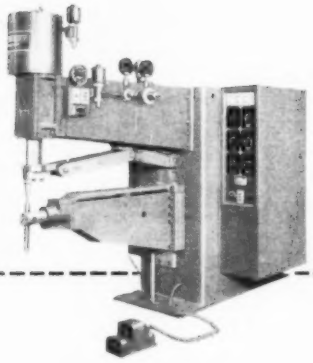

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Today, the new SCIAKY Series PMCO ST Three-Phase Welders offer new benefits to the aircraft industry and others welding aluminum, magnesium, brass, monel, inconel, stainless, super stainless, heat-resisting alloys and others. Each machine in this series is quickly adjustable to handle them all! Quality of welds is unequalled. Tip life is increased as much as 300%.

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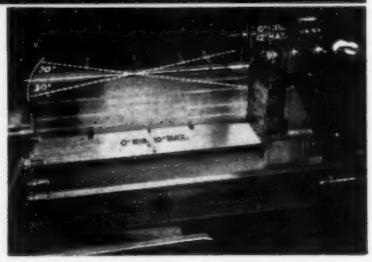
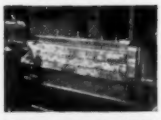
Here's a new work-holding fixture for general purpose milling work. It saves on miscellaneous milling jobs by eliminating time losses for adjusting mechanical clamps and the cost of special jigs or fixtures. It is a complete unit with Sundstrand Magnetic Chucks mounted on an adjustable fixture. Chucks are quickly positioned as required by the size of work piece and easily adjusted for angular milling cuts. If you have miscellaneous milling jobs requiring frequent changeover from one part or cut to another, it will pay you to investigate the savings possible with this new magnetic holding fixture. Sundstrand Magnetic Chucks are operated with an automatic demagnetizing control. There is no tube in rectifier to burn out. Generally, the input of the control unit is 110 volt A.C., which is rectified to 6 volt D.C., which in turn energizes the chuck. The low voltage eliminates possibility of shock to the operator, and no heat is produced to affect accuracy. Controls with inputs other than 110 volt A.C. can be furnished when required.



Sundstrand Magnetic Fixture showing adjustments. Note clamping is performed by merely throwing switch.



TYPICAL SET-UPS

These three set-ups illustrate only three of many different parts that are being run over one general purpose magnetic fixture in the manufacturer's plant.

Top — Milling steel tool blocks. Parts are run in lots of one to ten and are machined all over.

Center — Milling three steel cam bars simultaneously. Bars are 3 5/8" long x 2 1/2" wide and 1 1/4" thick and are milled all over in six operations.

Bottom — Milling cast iron motor bracket slide. Part is held for eight different cuts with same fixture.

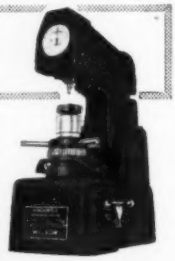
FREE
Additional Data

Complete information on Sundstrand Magnetic Chucks Will be sent on request. Ask for bulletin 112-M.

SUNDSTRAND
Magnetic Products Co.
Division of Sundstrand Machine Tool Co.
1020-9th ST - ROCKFORD, ILLINOIS

MAGNETIC POWER-LOCK

"ROCKWELL" HARDNESS TESTER
Made Only by Wilson



• When you invest in a "ROCKWELL" Hardness Tester, we don't know whether it will be used by your Chief Metallurgist or an inexperienced girl in your inspection department. We don't care to know. Because every "ROCKWELL" Tester is made to fill all requirements and to meet all conditions of use.

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chrome-clad steel tapes give you...

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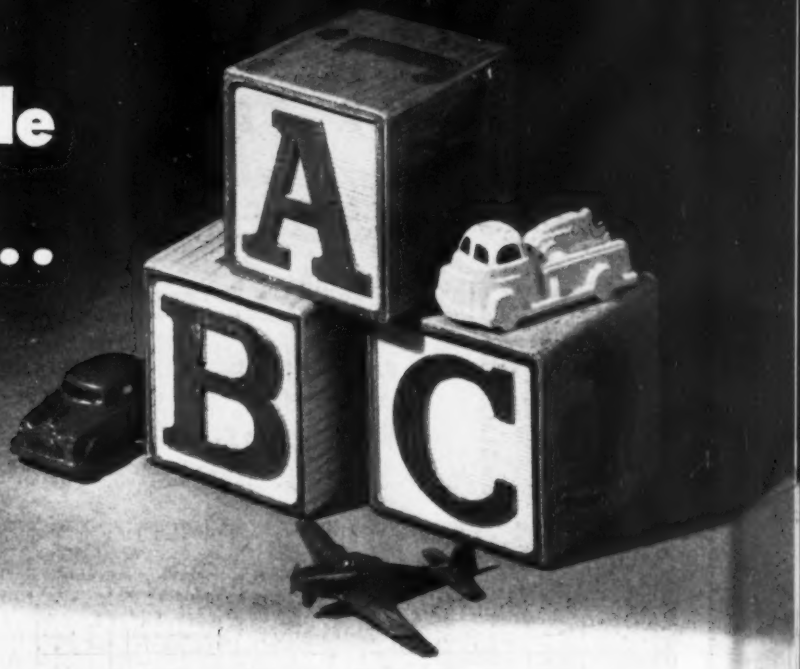

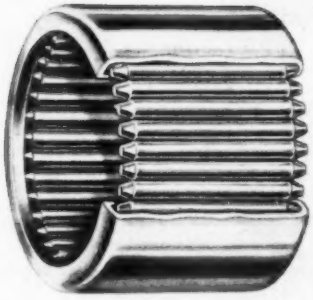

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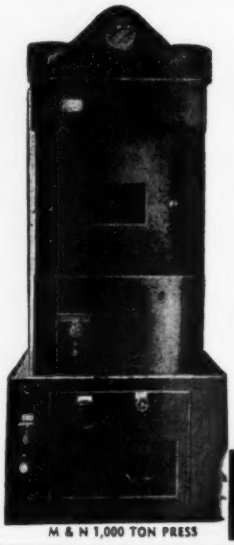
HOBBING PRESSES

are BETTER — *BUILT BY M & N!*



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Capacities from 100 to 2,000 tons

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4. **PRODUCTIVE** Press illustrated: 21" diameter ram has a 4½" stroke; each of 4 columns is 5¾" diameter; opening is 14" high, 17" from left to right and 30" from front to rear; press is operated by 3 hp motor.

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Made by specialists in Hydraulic Hobbing Presses.

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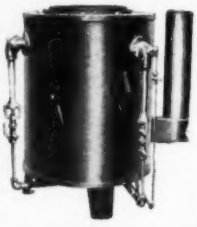

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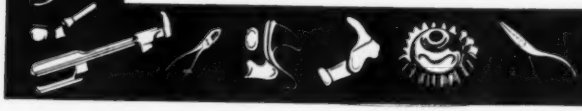

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. . . a toolmaker's lathe, designed for versatility and fast, effortless operation. Built with all the rigidity and stamina required for carbide tools.

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REAR STATION TOOL BLOCK • THREAD-LOCK SPINDLE NOSE (Patented)
AMPLE FRONT GUIDEWAY • FULL BEARING TAILSTOCK
COMPLETE ELECTRICAL SYSTEM
Can be had with *stepless spindle speeds* with ratio as much as 187 to 1.

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Tailstock spindle travel, 3¼" • Tool shank section ⅜" x ⅜"

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MICRO-DRILL PRESS

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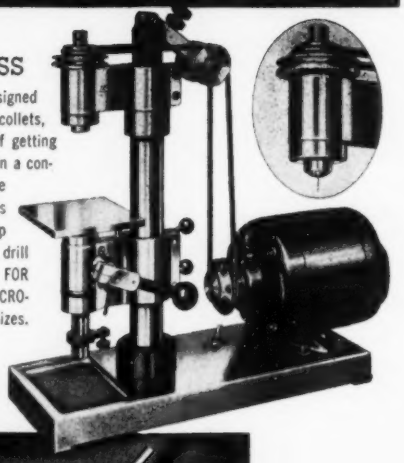
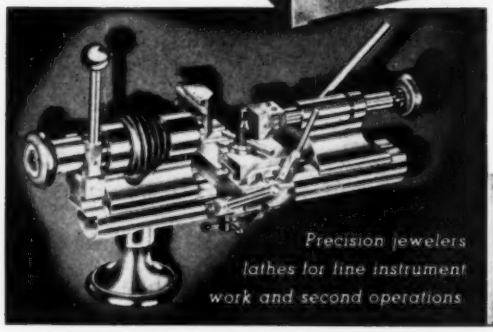
for drilling holes as small as .002"





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and save your larger machines for heavier work.

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Bores 5" holes in boiler plate in 80 seconds precise to .004". Finished holes can be bored from 1½" to 11¾" diameter to a depth of 8" in one fast operation on present equipment. A truly heavy duty tool . . . not just another trepanning cutter. Removes stock in one piece, saving material.

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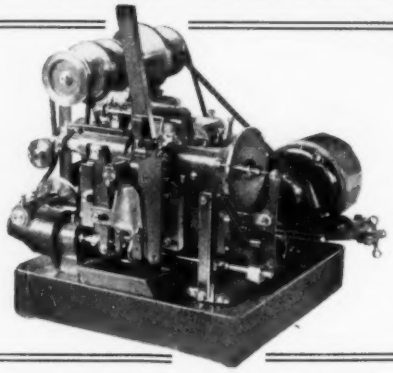

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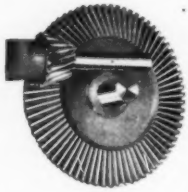

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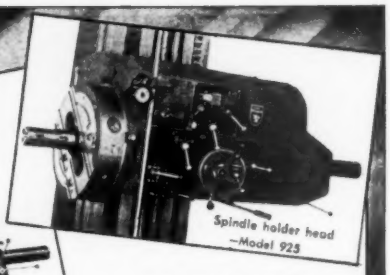
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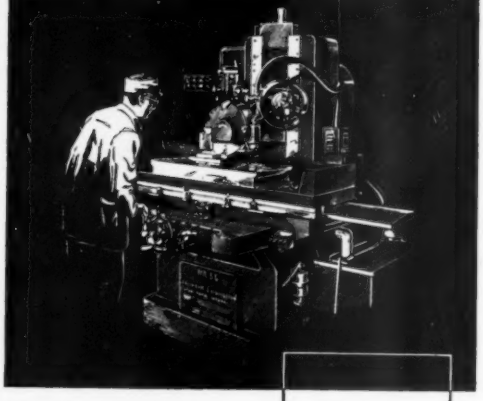

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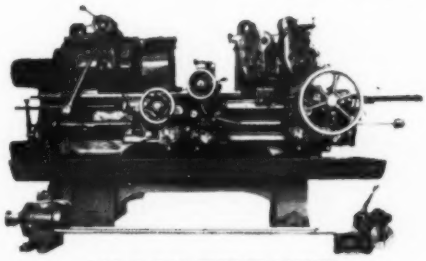

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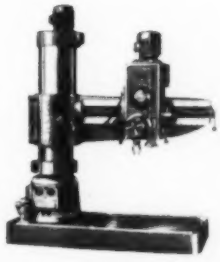

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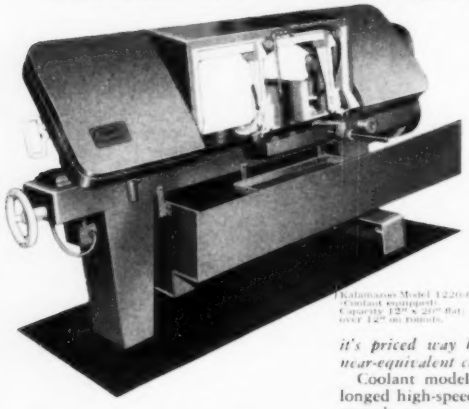
Kalamazoo
METAL CUTTING BAND SAW



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- 45° Swivel Leaf-Type Vise!
- Unobstructed View of Cutting Operation!
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- 1" Blade For More Speed and Precision!

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Speeds production and lowers unit cutting costs on all heavy duty cutting operations — intermittant or continuous. *Yet it's priced way below other saws with near-equivalent capacity!*

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Available without coolant equipment for use where operation is not continuous, or where non ferrous metals are cut.

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HAVE SERVED AMERICAN INDUSTRY
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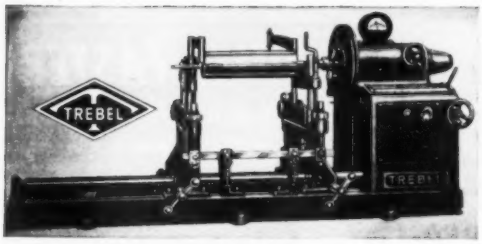

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with electro-mechanical measuring device

FOR the rapid determination of unbalances of rotating test pieces of all kinds and compensation in any two planes. Sensitivity of machine may be regulated during balancing. Accurate, direct readings without calculations, graphs or tables in 20 to 40 seconds.

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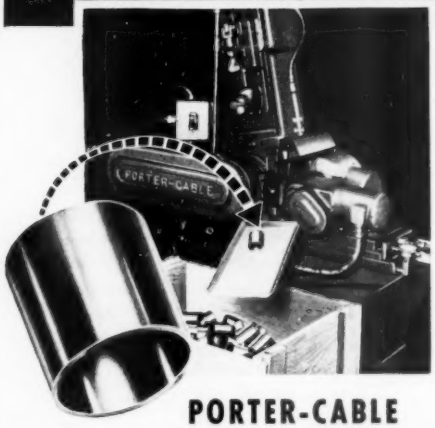

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The piece: Steel tubing, 16 ga. x 1⅜" O.D.
The job: Grind to size with a good finish. Maintain tolerance of .002".
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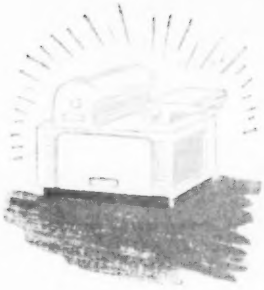

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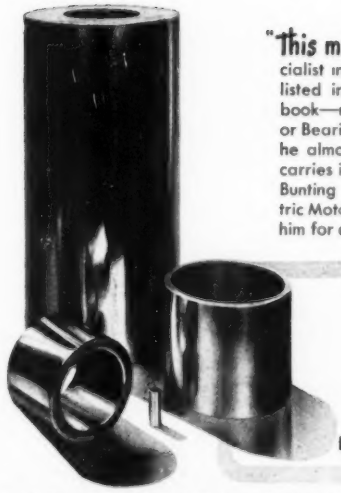

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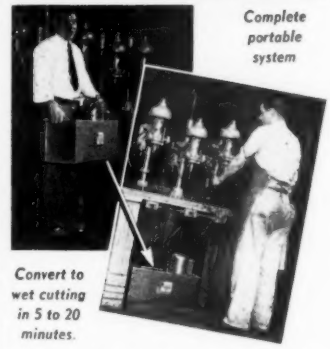

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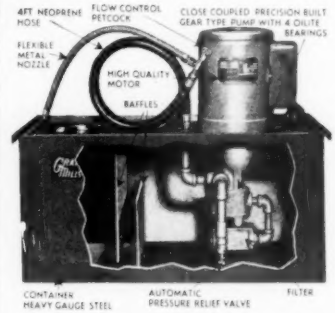

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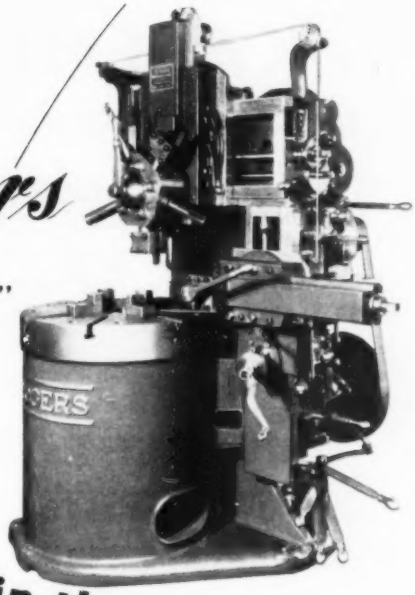

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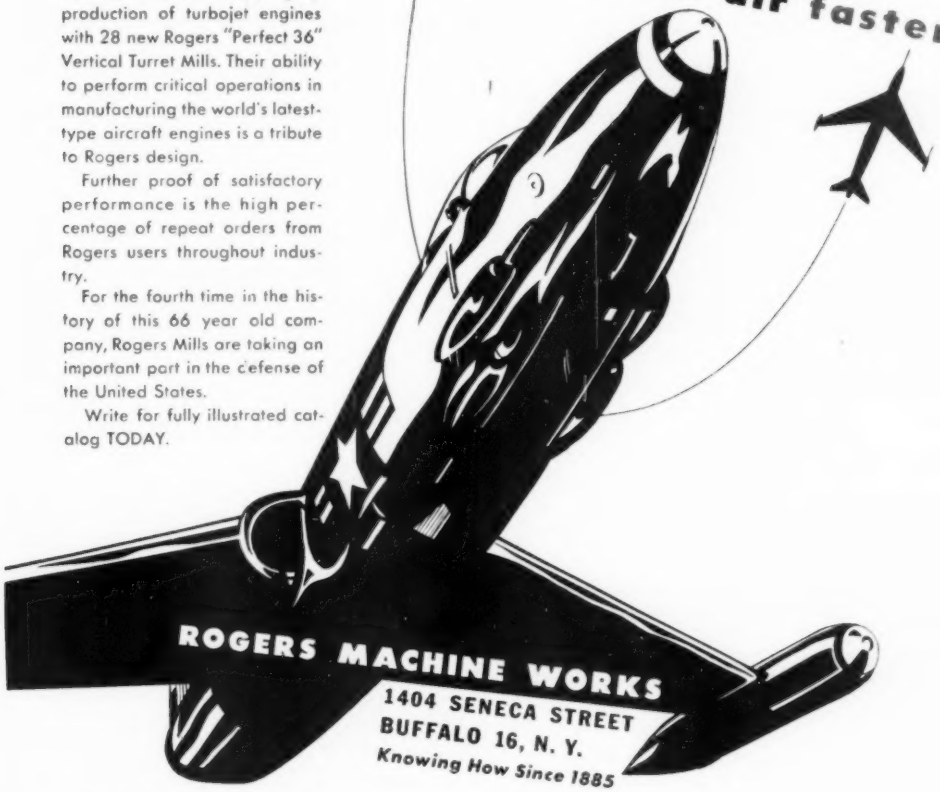

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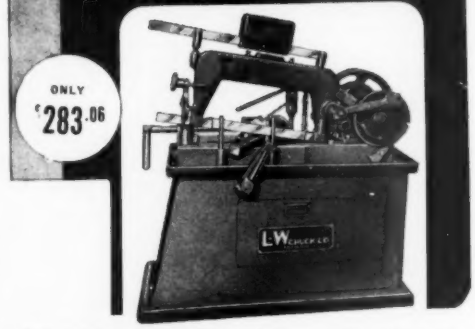

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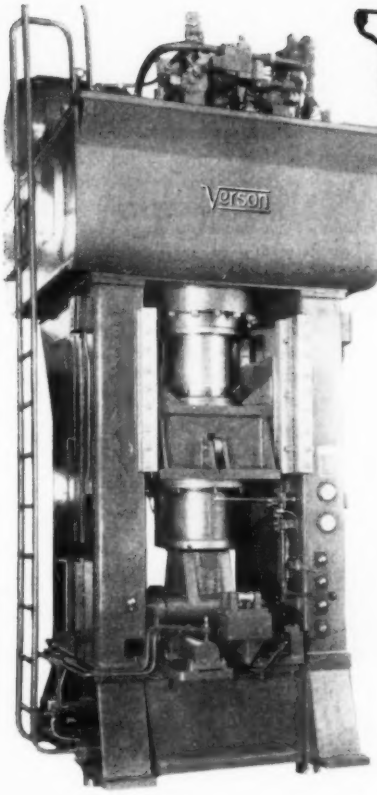

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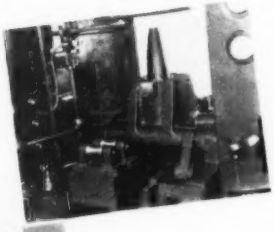
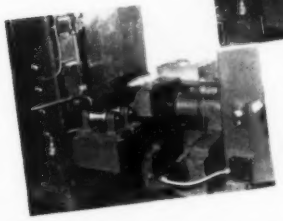


The shell ready for the nosing operation is automatically conveyed to the front of the press and into the open die pot (right) which then closes . . .



. . . and remains closed during the press stroke. After nosing, the die pot opens at the back (left) and the shell is conveyed away from the press.

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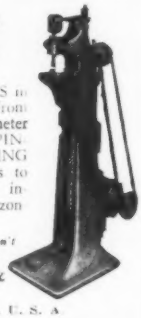

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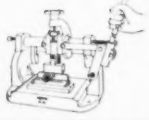

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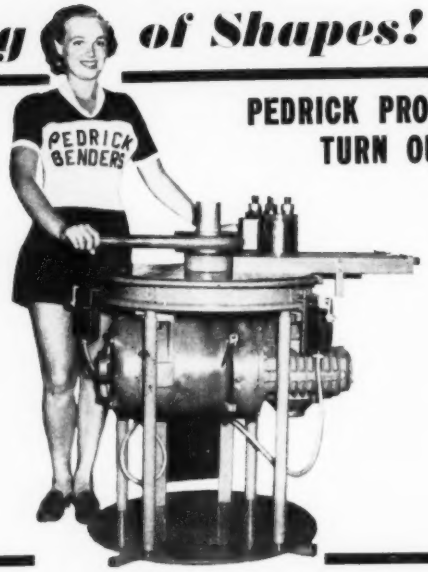

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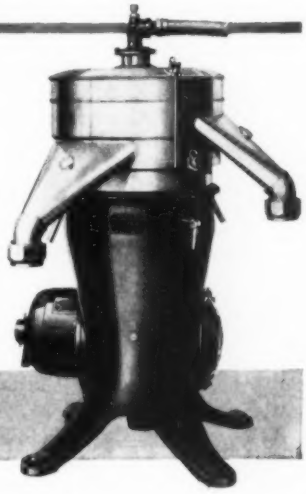

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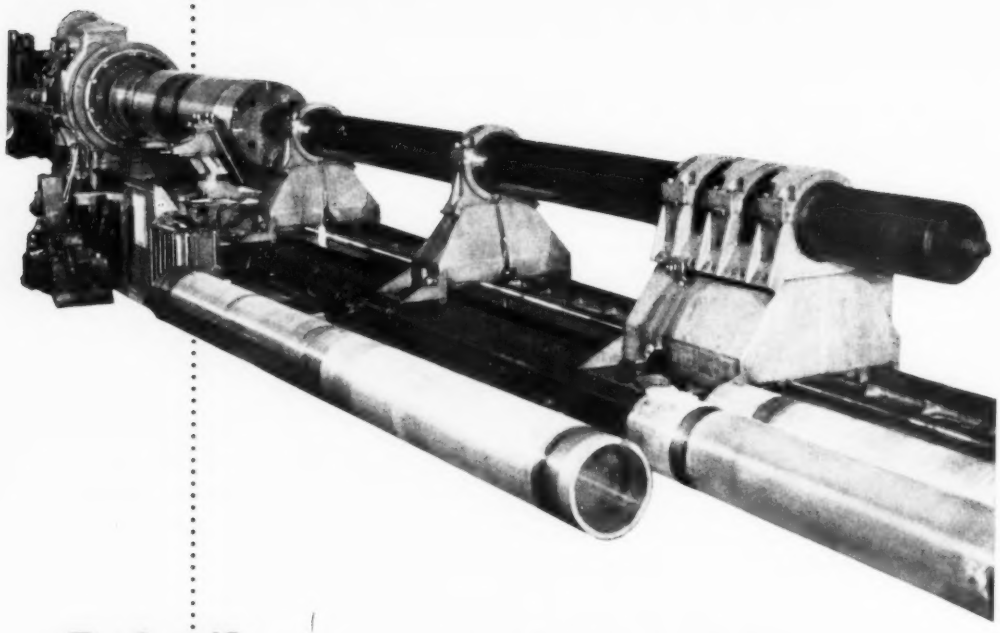

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In addition to adding new capacity, Simmons completely rebuilt the original lathe... dismantled it down to bare castings and thoroughly cleaned it... replaced worn parts... refinished sliding surfaces.

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Gives Machine Tools a New Lease on Life

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Precision workmanship at low cost. Available in 1" steps from 0 to 6".

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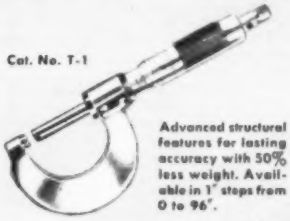

Advanced structural features for lasting accuracy with 50% less weight. Available in 1" steps from 0 to 96".

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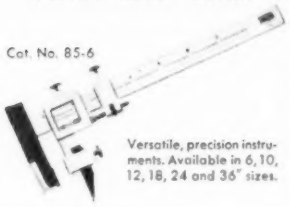

Versatile, precision instruments. Available in 6, 10, 12, 18, 24 and 36" sizes.

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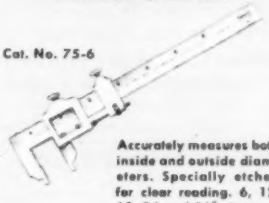

Accurately measures both inside and outside diameters. Specially etched for clear reading. 6, 12, 18, 24 and 36" sizes.

POCKET SLIDE CALIPERS

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Handy pocket size. Available in either high grade or stainless steel. 3 and 5" sizes.

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Flexible steel, spring tempered and clearly etched. Available in 6 and 12" sizes.

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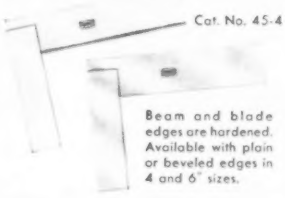

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Beam and blade edges are hardened. Available with plain or beveled edges in 4 and 6" sizes.

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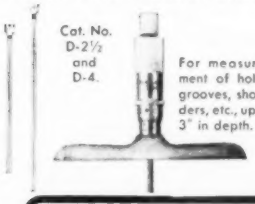

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For measurement of holes, grooves, shoulders, etc., up to 3" in depth.

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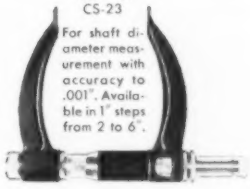

For shaft diameter measurement with accuracy to .001". Available in 1" steps from 2 to 6".

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SEARCHLIGHT SECTION

(Classified Advertising)

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AUTOMATIC, National-Acme Sgle. Spdl. 4½".
BORING MILL, Lucas #31 Horiz. 3" Bar.
BORING MILL, Giddings & L. #32 Horiz. 3½" Bar.
BORING MILL, Ryerson #11 H.
BORING MILL, #0 Giddings & Lewis, 3½" Bar.
BORING MILL, 24" Bullard M.D., V.T.L.
BORING MILL, Bullard 36" Rapid-Prod., M.D.
BARRELS, Tumbling, Almco, Lupomatic, Baird.
BORING MILL, Cleveland Horiz. 2½" bar, cap.
BUFFER, Model #95 U. S. Electric, 4 speed.
BROACH #3 LaPointe Horiz. 50" Str.
COMPRESSOR, Chicago Pneumatic 178 CFM
CRANE, OET Shaw 10 tons, 58'8" span.
CHIP WRINGER, Barrett #251, M.D., 18" dia.
CUTTER, 74" Oswego Automatic Paper, M.D.
CRANE, OET Ricker 2 tons 11'9" span.
RADIAL DRILL, Carlton 4'-15" Motor on Arm.
RADIAL DRILL, Cincl.-Bickford 3½x9", A.C., M.D.
RADIAL DRILL, Cincl.-Bickford 5' arm, 13" col.
DRILL, Deep Hole, Avey-Draulic #2.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel
DRILL, Edlund #2B, 3 sadle, #2 M.T., 16".
DRILL, Cincinnati 21" with Tapping Attach.
DRILL, Natco Multiple Spindle #17, #1 M.T.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S., #4 M.T., 4½" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #5 M.T.
DRILL, #2MS Leland Gifford, 4 spindle, #2 M.T.
DEEPFREEZE, Cascade 120° F., Industrial Chilline
FILING, #3 Thiel & Sewing, M.D.
FURNACE, Westinghouse Elec. 18 KW, 2100° F. cap.
FURNACE, Naehler Steam Oven, Serial #3533.
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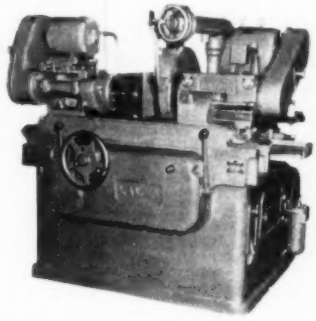
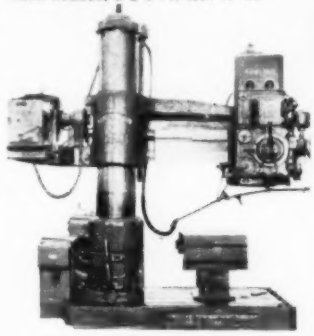
GRINDER, Oakley #3 Univ. Tool & Cutter.
GRINDER, G & L #4 Univ. Tool & Cutter.
GRINDER, Heald Rotary #25.
GRINDER, Hydraulic Contour, Landis Cam 5"x40"
GRINDER, Cylindrical, Norton 10"x24".
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Brown & Sharpe Cylindrical #10, 6x18
GRINDER, Cylindrical, Cincl. 6x18 Filmatic.
GRINDER, Thread, Jones & Lamson #TG-615
GRINDER, Landis Crankshaft 10x32 Hydraulic
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, Pratt & Whitney 14x36 Vert. Surface.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Springfield -2 Planer Type Surface.
GRINDER, Greenfield #12 Int. Hydromatic
GRINDER, #51 Oliver Auto. M.D. Drillpointer.
GRINDER, #33 Abrasive Vert. Auto. Surface
GRINDER, #22 Heald Horiz. Rotary Surface.
GRINDER, Diamond Snagging 10 HP, 24"x1".
GRINDER, #60 & #70 Heald Internal.



LANDIS 6 x 18 Hyd. Cyl. Grinder, Type C. Serial #29196.

GRINDER, Landis 6"x18" Hyd. Cyl. late type.
GRINDER, Sellers Type #1A Tool, 24" wheel
GEAR HOBBER, #3 Barber Colman, M.D.
GEAR HOBBER, B & S #34 Spur, 18" dia.



4'x15" CARLTON M.D. Radial Drill, 48 spls. speeds 22 to 1200 RPM.

GEAR SHAPER, Fellows #6 High Speed.
GEAR SHAPER, Fellows #72 High Speed.
GEAR SHAPER, Fellows #7 High Speed.
HAMMER, Rochester Hispeed, all sizes M.D.
HAMMER, Bradley 260# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D., Cold, 3/16".
HEAT TREAT ROOM, complete with Furnaces.

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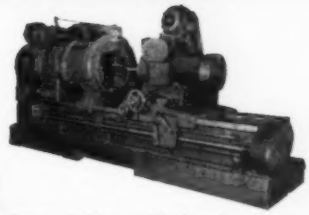
Hilles & Jones #6 Pyramid Type Motor Driven Plate Bending Rolls. Size—14'x¾" Plate. Top roll—22" dia. Lower rolls—15" dia. Imm. Deliv.

KEYSEATER, #5 Mitts & Merril, Giant, M.D.
LATHE, Bullng Dble. End #VMT5, Devine Bros.
LATHE, Pond 36"x108" Grd. Hd. With Equip.
LATHE, Bridgeford 32"x16' Q.C.G. Grd. Hd.
LATHE, Lodge & Shipley 24"x8' Heavy Duty
LATHE, LeBlond 24"x14' Q.C.G. Grd. Hd.
LATHE, Hendey 20"x10' Q.C.G., Taper Att.
LATHE, Reed-Prentice 20"x10' Grd. Hd.
LATHE, Lodge & Shipley 18"x8', Q.C.G., Gr. Hd.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, American 16"x6' Q.C.G. Grd. Hd.
LATHE, LeBlond 16"x6' Q.C.G. Taper Attach.
LATHE, Lodge & Shipley 16"x6', Q.C.G., Grd. Hd.
LATHE, Hendey 14"x8' Q.C.G. Taper Attach.
LATHE, LeBlond 14"x6' Q.C.G.
LATHE, Hendey 12"x5' Q.C.G. Taper Attach.
LATHE, Le-Swing 8"x108", M.D., A.C.
LATHES, TURRET, Warner & Swasey Univ. #4 1½".
LATHE, TURRET, Warner & Swasey #3A Univ. Grd. Hd. Bar feed, tooling & collets, AC Motor.
LATHE, TURRET, Simmons #2 Vari Drive 220 V.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, Turret Oster #60H W.O. Rapiduction.
LATHE, TURRET, Warner & Swasey #5 Grd. Hd. Ram Type, Bar Feed, Motor in base.
MILL, 2A Brown & Sharpe Horiz. Univ.
MILL, #4B Brown & Sharpe H.D., Horiz.
MILL, #14 Garvin Plain Horiz.
MILL, #0Y Brown & Sharpe Plain Horiz.
MILL, Bridgeport Model #BH, M.D.
MILL, Van Norman N.D. Hand Mill, late.
MOTOR GENERATOR SET, 100 KW Gen. Elec.
MILL, Cinc. Horiz. #2, #3, #4, #5, High Power.
MILL, Cinc. Vert. #2 #3, #4, High Power.
MILL, Cinc. 16" Mfg. Type with Vert. head. Late.



Sommer & Adams #20A Threading, Hobbing & Boring Machine, swings 36", 42" centers, 18" cross feed, last one threading breech blocks on 105 MM guns.

MULT-MILLER, U.S. Tool #MM-1-6, Auto. Prod.
MILL, #30H Sundstrand Two Spindle Hyd.
MILL, #1-M Kent-Owens M.D. Plain Horiz.
MILL, PLANER, Ingersoll 42x36x12, 4 heads.
MILLING MACHINE, Kempsmith #3, Horiz. Univ.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILLING, Brown & Sharpe #1½ Horiz. Univ.
MILLING, MACHINE, Kempsmith #2 Horiz. Univ.
MILLING, Brown & Sharpe #2 Horiz. Univ.
MILLING MACHINE, Van Norman #2 Duplex.
MILLING MACHINE, K & T #2B, Horiz.
NIBBLER, #2 Savage Roller Die ⅜"x36" cap.
NIBBLER, Gray Turret Type ¼"x24" cap.
THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILLER, Hanson Whitney 4"x8" Univ.
THREAD MILLER, Lees Bradner #40A Automatic
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine.
PAPER SHREDDER, #10 Mitts & Merrill, M.D.
PLANER, Gray 30"x30"x10' A.C. Motor Dr.
TAPPER, W & S #1 Sgle. Spdle.
POWER PRESS, Bliss #164 Open Back.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x24" Bed Area.
POWER PRESS — Bliss - Consolidated #163 - B Straight Side Dble. Crank, 45 tons.
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PRESS, #14 Toledo, Horn, M.D.
PRESS, Robinson #3 O.B.I. 88 tons, M.D.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS Toledo 50¾ S.S. 440 ton cap. 8" str.
PRESS Waterbury-Farrell High Speed 60 tons #3W
PRESS, 6¢C Bliss Double Action, 3 crank.
WHEEL PRESS, Cahill 200 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor M.D.
PRESS, #68 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.

LESTER PHOENIX DIE CAST MACHINE

Model HP-2-SF. For alum., brass, and magnesium. Late model, 1947. Used less than 100 hrs., Imm. Deliv.

PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, Hecker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End, 24" Thr. 1" thru 1".
PUNCH, H&J #5 Sgle end, 48" Thr. 2" thru 1½".
RIVET SETTER, ⅝" cap. Penn. Tubular Rivet.
ROLLS, #1 Buffalo Forge Wrapping.
ROUTER, #W240D, Onsrud, Electric H.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade
CUT-OFF SAW, Yates-American #M-90.
SAW, #302 Campbell Abrasive Cut-off.
SAW, #20-C Racine Shear Cut 6"x6" cap.
SAW, NS18-10 Greb Band & Butt Welder.
SAW, Band, Tanneuitz #GH-36" High Speed
SHAPER 16" American B.G. Motor drive.
SHAPER, 32" Cinc. B.G., Motor driven.
SHAPER, Columbia 32" B.G. Crank.
SHAPER, Morton 36" Draw-Cut, 4-Speed.
SHAPER, G & E 24", high duty, back geared, M.D.
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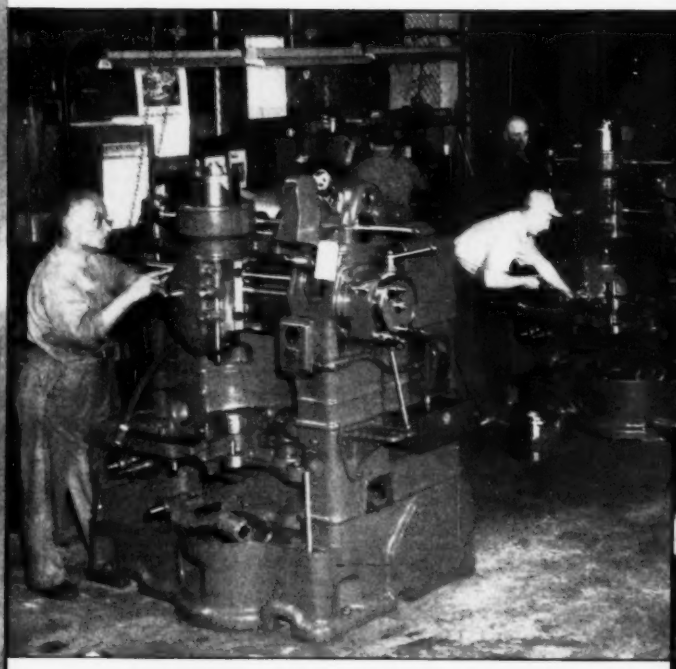
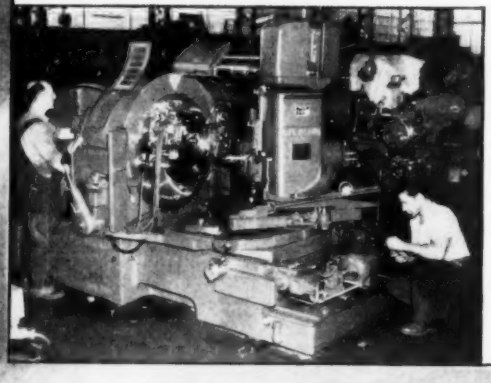


REBUILDING and Reassembling a battery of GEAR SHAPERS

Hand Scraping in a Slide on Fellows Gear Shaper



Rebuilding Gleason Gear Grinder — Preparing Machine for Final Test

Dismantling Cleveland Automatic Screw Machine for Rebuilding — from the ground up.

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No. 1FU Foster Fastermatic Automatics, late, serials 164 and 174, quantity of extra tooling (2)

No. 00, No. 0, and No. 2 Brown & Sharpe Automatic Screw Machines and Turner Drives.

4½" Cleveland Model A Automatic Screw Machine, serial ≠34486.

No. 865 New Britain Chucking Machine, late.

No. 3A Warner & Swasey Saddle Type Turret Lathe, M.D.

No. 4A Warner & Swasey Saddle Type Turret Lathe, M.D.

No. 3L Gisholt Geared Head Turret Lathe, serial ≠687-24, bar feed and chucker, late.

No. 4R Acme Turret Lathe, bar feed, late.

36-90 Cincinnati Hydromatic Duplex Milling Machine, serial ≠3B38D1L—1, late.

No. 0-8 Cincinnati Vertical Mill, late.

No. 3VG Reed Prentice Vertical Mill, late.

No. 14 Cochran-Bly Universal Mill Shaper.

6" Pratt & Whitney Slotter, M.D.

No. 2 LaSalle Hydraulic Surface Grinder, late.

10"x18" Landis Cylindrical Grinder, late.

Baush Radial Drill and Tapping Machine, late.

Two Bushel Barrett Oil Separator, late.

3" Gleason Bevel Gear Generator, late.

50 Ton Henry & Wright Dieing Machine, Reeves drive.

Agents for Cincinnati Lathes and Canedy-Otto Drill Presses

• **SCARCE MACHINE TOOLS.**

MACHINE TOOLS

TELEPHONE TAylor 9-8200

LAKE MACHINERY COMPANY

942 WEST LAKE STREET • CHICAGO 7, ILLINOIS

SHELL DRAWING PRESS

30" stroke, 200 Ton Verson Model ≠40 ES, 1943 machine, Straight Side, 30 HP motor.

TOGGLE DRAWING PRESS

500 Ton, Model ≠410-A, "Bliss", 62" shut height, 60" x 84" bed area.

DOUBLE CRANK PRESS

255 Ton, Model ≠96-D Toledo Try-Out Press, 30" shut height, 42" x 84" bed.

Also

150 Ton, Model ≠60-D-84, Cleveland 12" stroke, 30" shut height, 46" x 86" bed.

PAUL'S MACHINERY CO.

6111 VERMONT DETROIT 8, MICHIGAN

ROLLER LEVELLERS

McKay ½" to 2", 4 High Leveller, 17" dia. rolls, 13 rolls, backed-up, 1943 machine, 350 HP motor, Selling for 1/5 of New Cost, Used only 6 months.

McKay ¼ to 2", 2 High Hot Plate Leveller, 15" dia. rolls, 150 HP, 13 rolls.

PAUL'S MACHINERY CO.

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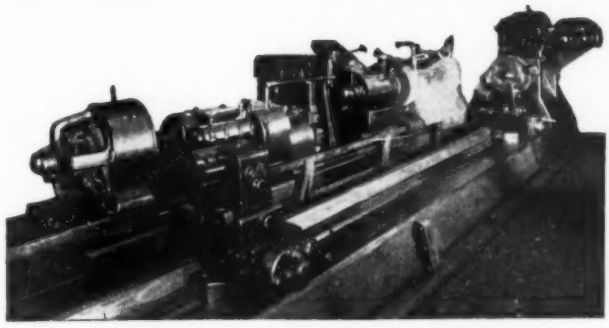
SOME LATE MACHINES STILL AVAILABLE



Norton Roll Grinder 50" x 28' (actual photo)

BORING MILLS

Bullard 24", VTL New Era
Cleveland 2½" Bar Cap
Giddings & Lewis No. 0, 3" cap
Giddings & Lewis No. 32, 3⅜" cap
King 42", 72" Vert. 2 rail head
Niles-Bement-Pond 4" Bar
Niles-Bement-Pond 4½" Bar
Niles-Bement-Pond 60" Vert.

DRILLS AND RADIALS

Bausch Multi-spindle
Bausch Radial Drill & Tapper
American 6'x15" Univ.
Buffalo #2 Motor Spindle
Cincinnati Bickford 6'x13" col
Walker-Turner Radial, 2½"
Leland Gifford 2LMS
Natco #12 20 spindle

ENGRAVERS

Auto Engravers Bench Type
Deckel Type 3 GK2 Dimensional, Nice
Gorton #1A, 1D, ME
Gorton #3B 3 Dimensional

GEAR EQUIPMENT

Barber-Colman #3, #2
Barber-Colman #12 Hobber (2
Fellows High Speed Shapers 712, 72, 725, 71
Flather 72" Cutter
Gleason 3" Straight Bevel Generator
Gleaosn #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
National Broach Red Ring Lapper, Shaver
Schuchardt & Shutte #1 Hobber
Fellows #20M Redliner

GRINDERS, MISCELLANEOUS

Bryant #5 Internal, chucking
Covel #91A Univ. Tool & Cutter
Grenby Int. 1G-12, G2
Heald #73 Internal centerless
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic, #1 Tool
Landis 12"x36" Univ., Latest
Landis 6"x30" Type C Cyl.
Majestic Internal
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 6"x30", 10"x18" Type C cyl.
Norton 14"x96" cyl.
Norton 16"x48" Type C Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer, Sellers 4G
Pratt & Whitney Contour
Pratt & Whitney Radius #R6, K.O. Lee Tool
Van Norman #666 Crankshaft
Vernon Tool & Cutter
Wicaco Internal

GRINDERS, SURFACE

Abrasive 8x24", #33 Vert.
#10 Blanchard 16" Chuck
Blanchard #16, 30" Mag. Chuck
Brown & Sharpe #2 Mag. Chuck
G & L #45 12"x24" Hyd. Feed, #5, 10"x36"
Heald 22—12" chuck, Arter 12"
Pratt & whitney 12x36" Vert.
Reid 11x36 Motor In Base

LATHES

Bertram 28"x22' CC, Late
Bridgeford 36"x20', 32"x16'
Lodge & Shipley #3 Duomatics
Hardinge Precision 9", 1" Collet Cap., Rivett
Hendey 12"x42" Geared Head Late, 12"x30"
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed
Lipe-Carbo 12"x18" (2)
Monarch 12"x30" CKK Late (3), CK
Putnam 36"x22"
Putnam 42"x17"
Sebastian 12"x4' G.H.
Wickes 32"x35' Geared Head
Reid Small Piece #9WSL
Sundstrand 8x15"
Sundstrand 15" Stub

MILLS, PLAIN, UNIVERSAL & PROD.

Archdale Plain, 14", Prod.
Brown & Sharpe #000, 21
Burke #4 Plain & Univ.
Cinn. 08 Plain
Cinn. 1-12 Mfg., 1-18
Cincinnati 1 M Univ.
Kent Owens 1V
Milwaukee #2B, Plain & Univ.
Simmons Micro-Mill
Sundstrand 0, 00 Rigidmills
Van Norman #2 Universal
Van Norman #3 SP.

MILLS, VERTICAL

Brown & Sharpe #3 single pulley drive
Cincinnati #4, 05 Vert. #2, 3, SPD
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 SP

PRESSES

Bliss 304A 4" Str.
Bliss 645, 650 Hi-Production Presses
Bliss 18, 21, OBI, 58, 62, 162 OB
Bliss 4½ Double Action, Roll Feeds, Cam (2
Bliss #78½, 330 Ton, SS, Bliss 74½
Ferracute EGS4, 400 Ton Knuckle
Niagara Horning, 15 Ton
Niagara A1¾, O.B.I.
Toledo 400 Ton Knuckle Joint #663
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing

TURRET LATHES

Acme 6W Fox 2 9/16" Cap
Bardons & Oliver #2 Late, #3
Brown & Sharpe, #1, 2 Hand, #10, 11
Denver, 6 2" Shell Turret (2)
Foster #3B 4½" Cap.
Gisholt #4 bar feed, Late
Hardinge second operation
Jones & Lamson 2½" Saddle Univ. Late
Morey #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, 2A
Warner & Swasey #2 & #3 Timken Head

MISCELLANEOUS

Automatic, Cleveland Model B 1 1 16"
Automatic B & S #00G
Automatic 4 Sp. 1½ Conomatic
Band Saw: DoAll Zephyr 36"
Band Saw: #8 Marvel
Filers—DoAll Band Filer
Filers—Grob Band Filer
Hacksaw: Peerless 6"x6"
Hacksaw: Racine 10x10" Hyd
Honer: Micromatic #H-1
Keyseater: Davis, Baker, M & M
Shapers: 24" Rockford, 24" Cinci., 28" Gould & Eberhardt. Many Others
Shears Power: George Ohl 10'x3-1 16", 10' x 16 gauge, 11'x16 gauge, and New Wysong & Miles 8' 3-1 16"
Toppers: #1 Bakewell, #3C Haskins
Vertical Shaper: Pratt & Whitney 6" Model "B" 1941
Welder: 50 KVA Eisler Air Operated
Welder: Taylor-Winfield 50 KVA Hi-Wave

HYDRAULIC EQUIPMENT
SELF CONTAINED PRESSES

500 ton Shaft Straightener 24' Long Bed. Watson Stillman
125 Ton Southwark Press, Bed 96"x30", 30" stroke, 2 to 4 ft. opening
80 Ton Wilson Press, 51"x24" Platen, 11½" St. 13" opening
50 Ton William & White Gap Press, 20" St. 54"x20" Bed—24" opening
600 Ton William & White Up-Moving Ram 42"x60" platen 12" str., 24" opening self-contained.

MISCELLANEOUS PRESSES

300 Ton Watson Stillman 24x20" Platen 11" St. 21" opening

All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.

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Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton—Injection Molders, 1 ounce—Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30 ton —Shaper 7" Amco, 8" Shaperite—Shaper Sheldon 12"—Shears, Foot 22" to 8', 16 & 18 ga.—Shears, Power 3'x18 gauge to 10' x 10 ga.—Welders, Arc, Seam, Spot all sizes—Vert. Milling Attach. Halco H.S. Motors Grinders, Buffers, all sizes

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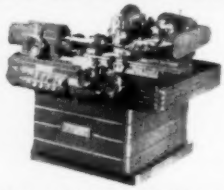
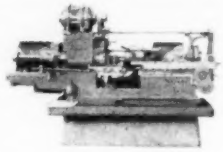


EXCELLO THREAD GRINDERS

Model 231 Excello Precision Thread Grinders. 5" diameter work ground, 18" between centers, 8" maximum thread length ground.

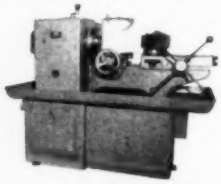
IMMEDIATE DELIVERY



18" CLEVELAND SHAFT MACHINES

Model "B" 18" Cleveland Shaft Machines. 11½" Capacity, 19½" stock feed stroke. 13½" Milling length.

IMMEDIATE DELIVERY



OSTER TURRET LATHES

Model 2601 Oster Turret Lathes. 1¼" round stock capacity, swing 14", over cross slide 6½.

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AUTOMATICS

No. 61 New Britain, 1⅝" cap. 1942.
2" Cleveland, Model A, 1942.
1-1/16" Cleveland, Model A. 1943.

DRILLS

No. B2A Natco Single Spdl. Latest.
16 Spindle Barnes, Hydraulic. 1942.

DRILLS, SENSITIVE

No. 4B-12 Edlund. 1942.
No. 2B-8 Edlund. 1942.

GEAR EQUIPMENT

No. 6 Gleason Revacycle Generator. 1940.
No. 645A5 Fellows Gear Shaper. 1943.
No. 72 Fellows Gear Shaper. 1942.
No. 7 L.S. Fellows Gear Lapper. 1944.
Pratt & Whitney Gear Grinder. 1942.
8" Red Wing Internal Shaver. 1942.
15" Red Wing External Lapper. 1942.
Red Wing Univ. Gear Checker. 1942.

GRINDERS, CYLINDRICAL

14"x158" Norton Plain Type C. 1942.
14"x48" Norton Type C Pl. Hyd. 1941.
14"x48" Landis Type C Pl. Hyd. 1943.
10"x36" Cincinnati Plain Hyd. 1942.
10"x18" Landis Type C Pl. Hyd. 1942.
6"x18" Landis Pl. 45° Angle. 1942.

GRINDERS, INTERNAL

No. 24-36 Bryant Hydraulic. 1943.
No. 18 CP 16 Bryant Hydraulic. 1942.
No. 16-16 Bryant Hydraulic. 1942.
No. 172 Heald Hyd. Cap. 1940.
No. 73A Heald, Two Motor. 1943.
No. 72A3 Heald Plain Hyd. 1943.
No. 50 Heald Plain Hydraulic. 1943.
No. 104 Rivett Int. & Ext. 1943.

GRINDERS, SURFACE

14"x36" P & W Vertical Hyd. 1942.
No. 22 Heald Rotary, 12" Chuck. 1943.

GRINDERS, THREAD

No. 33 Excello Thread Grinder. 1943.
No. 31 Excello Thread Grinder. 1941.

GUN BARREL MACHINES

No. ½ Bx50 P & W Reamer. Latest.
No. ½ Bx30 P & W Reamer. Latest.
No. ½ Bx50 P & W Rifler. Latest.

LATHES, ENGINE

20"x20' Center LeBlond Heavy Duty. 1941.
18"x60" Reed-Prentice, G.H., M.D.

LATHES, PRODUCTION

No. 3FU Foster Fastermatic Platen. 1942.
No. 4D Potter & Johnston. Late.
No. 3D Gisholt Simplimatic. 1939.
20"x25" Fay Automatic. 1942.
14"x42" Monarch "Magna-Matic." 1941.
10"x12" LeBlond Multi-Cut. Late.
Lipe Carbo-Matic. 1942.
Lipe Carbo Lathe. 1942.

LATHES, TURRET

No. 5 Gisholt Universal. 1942.
No. 4AR Libby Hand Carriage. 1942.
No. 3 Gisholt Universal. 1942.
No. 2 Warner & Swasey Simplified. 1941.

MILLS

No. 2K Milwaukee Univ. 1943.
No. 2L Cincinnati Plain. 1940.
No. 3B Kearney & Trecker, M. D.

MILLS, PRODUCTION

No. 2-20 Kent-Owens Hydraulic. 1942.
No. 34-36 Cinn. Vert. Rail Type. 1941.
No. 3A Bullard Copy Mill. 1942.
No. 0B Cincinnati Plain Auto. 1943.

MILLING MACHINES, THREAD

6"x36" Lees-Bradner, Model LT. 1942.

WELDERS

Taylor-Winfield Hi-Wave. 1940.

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Gisholt 3S Dynetric Balancer Mfg. 1942

Sundstrand No. 10 Automatic Lathe, Complete Mfg. 1945

Bardons & Oliver 23 Ram Type Universal Turret Lathe Mfg. 1941

Bardons & Oliver 22 Geared Electric Turret Lathe (2 available) Mfg. 1942

Heald No. 25A Rotary Surface Grinder, 24" Chuck Mfg. 1941

Arter A-1-8 Rotary Surface Grinder, 8" Chuck Mfg. 1943

Brown & Sharpe No. 12 Automatic Mill 18" Table Travel Mfg. 1942

Brown & Sharpe No. 2 14"x30" Universal Grinder Complete Internal Attach. Mfg. 1942

Cleveland 3¾" Model A Single Spindle, Automatic with Tooling Mfg. 1943

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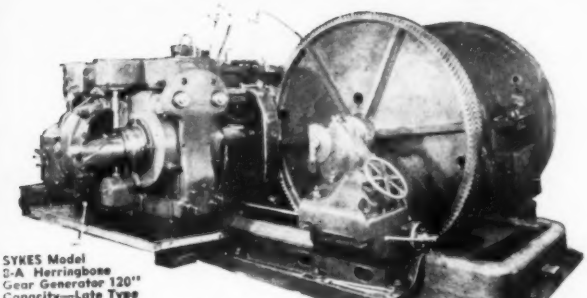

SYKES Model
8-A Herringbone
Gear Generator 120"
Capacity—Late Type

BORING MILLS—Horizontal
FRANKLIN 4¾" Bar; table type; M.D.
LANDIS #40, 4" Bar; floor type; M.D.
LUCAS #41 3" Bar, Late Type
NILES 8" bar floor type, motor drive
PEGARD Model 924 3⅛" Bar, New
PEGARD Model 925, 4⅛" bar; NEW
UNIVERSAL 3" Bar, Precision, Late Type

BORING MILLS—Vertical
BULLARD 8" 6-spindle "A" Mult-au-matics

BROACHES
CINCINNATI 1-30 Duplex Vert. Hydr.
LaPOINTE #2L M.D. Late
LaPOINTE S.R.V. 15-ton 48" Stroke, Late

DRILLS—Miscellaneous
BARNES No. 420 Deep Hole; late
BARNES H-3 Hydram; hydr.; Inverted; late
BARNES H-2 Hydram; hydr.; M.D.
BARNES 20" 4-spindle; Camel Back; Late
BARNES 24" all geared; Camel Back; M.D.
MOLINE 6-spindle Multiple Hole-Hog; 3½" dia.; M.D.
NATCO No. 14 Mult.; Rect. Hd.; PRT; M.D.
NATCO D-5 Multiple; adjustable; Late
BODINE #42-20 multi-univ., dial feed; M.D.

GEAR CUTTING EQUIPMENT
BILGRAM 6" & 16" Bevel Gear Cutter, M.D.
BROWN & SHARPE #13 Spur Bevel Cutter
BROWN & SHARPE 6-72" Auto. Cutter; M.D.
CROSS #1, #40 Tooth Rounders; M.D.
FELLOWS Nos. 6IA, 6Z2, 715, 75, 7, 7A, 75, 72, 77 High Speed Gear Shapers; late
FELLOWS 12-M Involute Meas. Instr.; Late
FELLOWS 13-LS Lapper; late
GLEASON 3" & 12" Straight Bevel Gen.; late
GLEASON #4 and #6 Tester, Late Type
GLEASON 10", 11" & 18" Bevel Gear Gen.
GLEASON 24", 37", 77", 96" Bevel Gear Planers; M.D.
GLEASON No. 14 Hypoid Grinder; late
PRATT & WHITNEY 10" Gear Grinder; late
SYKES #4A, #8A gear generator; M.D.

GEAR HOBBERS
BARBER COLMAN #12 dble. overarm; M.D.
GOULD & EBERHARDT #24H. Late
GOULD & EBERHARDT No. 36H; Late
GOULD & EBERHARDT #36BM 3 spindle Auto. Rougher; M.D.
KOEFFER WM-11 Auto.; bench type; Late

GRINDERS—Plain Cyl. & Univ.
CINCINNATI 14x48" Univ.; late
CINCINNATI 14x72 Model ER Plain, Late
LANDIS 10x36, 16x36 C Pl., Hyd., Late
LANDIS 4x18 type H; M.D.; late
LANDIS 6x18" Type C Plain; Hydr.; late
LANDIS 10x18" type C plain Hydr. M.D.
LANDIS 29"x130" centers Plain; M.D.
NORTON 6x30 plain; motor drive
NORTON 10x72" type C Plain; Late
NORTON 17x42" centers crankpin; Hydr. Dble. hd.; M.D.

GRINDERS—Surface
HEALD #22 Rotary, Late Type
HEALD #25A Rotary, Motor Drive
PRATT & WHITNEY 14x36" Model B, Late
BILLITTER & KLUNZ 48x196" Way Grinder
TAFT PIERCE 6" Rotary, M.D.

GRINDERS—Miscellaneous
BRYANT No. 3, 5, 5A, 16-C-16, 16-CF-16, 24-36" Internal hydr.; Late
GLEASON No. 12 Tool Sharpener; late
HEALD No. 81 "Sizematic"; Late
HEALD No. 72-A-5 "Gagematic" Int.; Late
HEALD No. 72-A-3 "Gagematic" Int.; Late
LEMPCO 22x72" Mod. KG Crankshaft; Late
VAN NORMAN 666 Crankshaft Regrind
VAN NORMAN 639 Osc. type Radius; Late

LATHES—ENGINE & MFG.
AMERICAN 25"x220" centers; Timken; Late
AMERICAN 36"x360" centers; 2 carriages
AMERICAN 36"x33' centers geared; heavy
JONES & LAMSON "FAY" 20x25" Automatic; M.D.; Late
LEHMANN 25x96" cntr; TIMKEN; grd M.D.
LeBLOND 16x36" cent.; Auto.; Timken; late
LeBLOND Mod. 7ACL Crankshaft; M.D.
LODGE & SHIPLEY 24x120" centers, Late
LODGE & SHIPLEY No. 5—24" and 96" centers DUOMATIC; Timken; Late
LoSWING 4x60", 8x24", 8x108"; late
MONARCH 14x42" centers "Z" Magnamatic Auto.; TIMKEN; M.D.; Late
MONARCH 22"x456" Centers "CM" Precision; helical geared; TIMKEN; M.D.
NILES 36"x50' Boring "Time-Saver"; Timken; Late
NILES 48"x32' centers Engine; geared; M.D.
REED PRENTICE 16"x24" centers grd; M.D.
SPRINGFIELD 14"x43", geared; M.D.

LATHES—TURRET
GISHOLT No. 3, 4, 5 Ram; TIMKEN; Late
LIBBY 1H-5 Universal, Late Tye
MOREY No. 2 ram type TIMKEN
J & L No. 8A; Late

MILLING MACHINES—Plain
BROWN & SHARPE #12. Late
BROWN & SHARPE No. 4, TIMKEN; Late
CINCINNATI 0-8; M.D.; Late
CINCINNATI 4-48, 4 spindle, Tracer; Late
CINCINNATI 1-18, 2-24 Timken, Late
KEARNEY & TRECKER, MILWAUKEE #3 Timken, M.D.
SUNDSTRAND No. 3 Rigidmill; TIMKEN
PEGARD #1 Plain, New

MILLING MACHINES—MFG.
CINCINNATI #24 Duplex; SPD
GOULD & EBERHARDT 25 Cont. type; M.D.
INGERSOLL 32x24x16" Planer Type; 2 hds.
INGERSOLL 30x24x12' Adj. Rail Slab; M.D.
INGERSOLL 42"x42"x16', 4 heads, Planer Type, Late
SUNDSTRAND Mod 3A Duplex 42" feed M.D.
TAYLOR & FENN M-80 Duplex Spline; Late

MILLING MACHINES—Vertical
CINCINNATI 0-8 Mod EA Automatic PRT; M.D.; Late

MILLING MACHINES—Thread
HALL Style D Planetary, Late Type
LEES BRADNER HT 12", 54", M.D.; Late
MOREY 12x30", 12x60" centers; late
PRATT & WHITNEY 4½x12 Mod. C, late
PRATT & WHITNEY 6x132; M.D.

PLANERS
BETTS CONSOLIDATED 84"x92"x16' 4 heads PRT Box Table; DC Reversing M.D.
BETTS CONSOLIDATED 108"x84"x44' 4 heads; PRT; Box Table; M.D.
CLEVELAND 48"x48"x12' Openside; AC; M.D.
DETRICK & HARVEY 48"x48"x16' hydr.
LIBERTY 48"x48"x16' 4 hds. Double housing; vari-voltage
LIBERTY 72"x48"x20' 4 heads; Convertible openside vari-voltage drive; late
NILES 108"x84"x42' 4 heads; Rapid Traverse; Box Table DC; M.D.
NILES-BEMENT-POND 72"x72"x30' 4 hds.; Rapid Traverse; M.D.
SELLERS 60"x60"x12' 4 heads vari-voltage dr.; PRT
WOODWARD & POWELL 54"x54"x20'; 4 heads; M.D.

SAWS
ESPEN LUCAS No. 670-30' cap Hydr.; Late
HELLER Model SS-1, 6⅝" Cap Cold Saw

SCREW MACHINES AUTOMATIC
NEW BRITAIN GRIDLEY Model 65 6 Spindle Chucker, Late
BROWN & SHARPE 00G High Speed, Late
GYROMATIC Model 40 2⅝" 6 Spindle, Late

SHAPERS—SLOTTERS
CINCINNATI 16", Heavy; PRT; Late
LeMAIRE 18" Vertical Hydraulic; Late
PRATT & WHITNEY 6" Vertical; M.D.
LYND FARQUHAR 26" Openside; M.D.
NEWTON 15" Slotter; M.D.
ROCKFORD 20" Vert.; Late

PRESSES
BESCO Mod. 21 Incl. 40 ton, 3" stroke NEW
BIRDSBORO 325 ton Vert Hydr; Late
BLISS No. 410A Toggle Drawing; tie rod; steel gearing
CHAMBERSBURG Horiz. Straightening, 24" str.; M.D.
BLISS No. 3½A geared toggle; dble. acting
GLEASON 15", 25" Quenching; hydr.; M.D.
NIAGARA No. 512 DG tie rod; 282 tons; M.D.
UNITED ENG. 500 ton hydr. forging
WATERBURY Farrel 125 Ton; St. Side

MISCELLANEOUS
ACME 2" forging, upsetting; late
AJAX 3½" forging, upsetting; M.D.
BAKEWELL No. 1, Precision Tapper
BAKER #5 Keyseater; motor drive
BARNES No. 172, 214 Honing; hydr.; Late
DeLAVAL No. 194 Coolant Clarifier; Late
FISCHER No. 1, No. 2 Oil Groover; Late
FOSTER 4x36" centers; Superfinisher; Late
GROB GS-20 Metal Band Saw—Filer; M.D.
GROB NS-24 Band Saw; M.D.; Late
LANDIS 2" sgle. Dble. Spdle. Threaders; M.D.
MANVILLE 2C Auto Screw Slotter; M.D.
MANVILLE No. 2 Slotters; Late
MANVILLE No. 3 Trimmers; Late
MANVILLE No. 2 DSOD Readher; M.D.
MANVILLE 1A DSSD Heater; M.D.
MANVILLE No. 3 Rehsaders; Late
MANVILLE No. 3C Thread Roller; M.D.
WATERBURY FARREL No. 11 Thread Roller
LeBLOND #2 Barrel Lapper; M.D.; Late
US TOOL 810-B Cutter Reliever; Late
NORTON 2F, 26F Lapping Machines; Late

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W. C. Lipe Carbomatic Lathe, m.d.
Colborne Mfg. Bench Type Speed Lathe, m.d.
No. 4 LeBlond Boring Lathe, 37" bed, 13" hole
No. 9, 12 LeBlond Multi-Cut, m.d.
3½x36", 3½x80", 4x60", 8x84" LoSwing, m.d.
8x132" LoSwing, m.d., latest
9x12" Sundstrand, s.p.d.
11x18" LeBlond Rapid Production, m.d.
12x18" centers Monarch Model 5T, m.d.
13"x24" Coulter Automatic Threading, m.d.
13x48" Coulter Automatic Threading, m.d.
15"x6' Automatic Threading Lathe, m.d.
15"x6' Automatic Threading Lathe, cone
16"x6' LeBlond Rapid Production, m.d.
16"x6' Lodge & Shipley Simplified Mfg., cone, motorized
17"x6' LeBlond Automobile Mfg., cone
17"x8' LeBlond Automobile Mfg., cone
20"x8' LeBlond Mfg., m.d.
21"x8' LeBlond Turret Lathe, cone
Niles-Bement-Pond Quartering Machine, m.d., new
30"x10' LeBlond Turning Lathe, cone
Schauer Type NA2B Speed Lathe, m.d.

HAND MILLING MACHINES

No. 3 Garvin, m.d.

MANUFACTURING TYPE MILLING MACHINES

No. 00 Sundstrand Rigidmill, m.d.
No. 1 Sundstrand Rigidmill, m.d.
No. 12 Brown & Sharpe, m.d.
No. 1-12 Cincinnati, m.d., latest
1A Sundstrand Copy Rigidmill, m.d.
48" Cincinnati Automatic Duplex, m.d.
No. 34-36 Cincinnati Duplex Hydromatic, m.d., with tracer control, latest
No. 56-72 Cincinnati Duplex Hydromatic, m.d., latest
No. 56-90 Cincinnati Duplex Hydromatic, m.d., latest
Type P Ohio Mfg., m.d.
4" Pratt & Whitney Spline, m.d.
No. 33 Kempsmith, s.p.d.
18", 24" Cincinnati Plain Automatic, m.d.
24" Cincinnati Duplex Automatic, m.d.
30"x36"x12' Ingersoll Slab Milling Machine, 2 heads, m.d.
48"x48"x20' Ingersoll Fixed Rail Milling Machine, for tank work
Carter & Hakes, m.d.

PLAIN MILLING MACHINES

No. 1BD Brown & Sharpe m.d.
No. 1B Milwaukee, m.d.
No. 1M Cincinnati, m.d.
No. 1½, 3 Cincinnati, cone
No. 2 Cincinnati Plain H.P., belted m.d.
No. 2 Rockford, m.d.
No. 2G LeBlond, belted m.d.
No. 3 Van Norman Duplex, s.p.d.
No. 4 Ohio, cone
No. 5 LeBlond, H.D., s.p.d.

THREAD MILING MACHINES

14"x16" U6 Automatic Hob, m.d.
Hall Planetary, m.d.
4½x12", 6x14", 6x20", 6x48" Pratt & Whitney
10x24" Hanson Whitney, m.d., latest

UNIVERSAL MILLING MACHINES

No. 2A Brown & Sharpe, s.p.d.
No. 2 Kempsmith, cone, motorized
No. 3 Kempsmith, cone

VERTICAL MILLING MACHINES

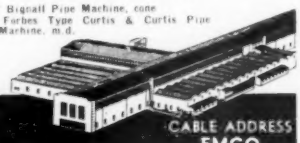
Sundstrand Rigidmill, m.d., vertical spindle
No. 0B Cincinnati, m.d., latest
No. 2M Cincinnati, m.d.
No. 3, 4 Cincinnati H.P., m.d.
No 2½B, 3B Milwaukee, m.d.
No. 3V Toledo s.p.d.
No. 5 Brown & Sharpe, cone
No. 6 Becker, cone
Newton Vertical Miller, rotary table

MILLING MACHINE ATTACHMENTS

16" Cincinnati Circular Milling Table, p.f.
Kearney & Trecker Attachment for Milling Bridge Reamers, 62" long & 24" wide
No. 3 Cincinnati Rack Milling Machine Attachment for No. 3 Dial Type Miller
Rack Milling Attachment for No. 3 Cincinnati H.P. Miller
Cincinnati Universal Spiral Milling Attachment for No. 2 Dial Type Miller
16" Kearney & Trecker Rotary Table, p.f.
Cincinnati Universal Vertical Attachment for No. 3 Miller

PIPE MACHINES

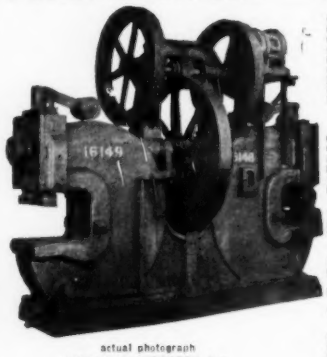
2" Bignall Pipe Machine, cone
2" Forbes Type Curtis & Curtis Pipe Machine, m.d.



WRITE FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

ONLY A FEW LEFT — CHECK THESE "BUYS"



actual photograph
LONG & ALLSTATTER Size
B Vertical Punch

PUNCHES—Multiple
CLEVELAND #1 cap. (40) 13 16" holes, 6" str.
CLEVELAND Cap. (4) 13 16" holes, 3" str.
SOUTHWARK 400 ton; stroke 2"
THOMAS #20, Cap. (40) 13 16" holes, 3 str.
WILLIAMS & WHITE Vertical; 6" str.

PUNCHES—Horizontal
HILLES & JONES No. 2, 1½" str.; Cap. 1"x1"
HILLES & JONES No. 2, 1½" str.; Cap. 1"x1"
HILLES & JONES No. 3, 1⅝" str.; Cap. 1"x1"

PUNCHES—Vertical, Open Gap
CLEVELAND, 1¼" stroke; Cap. ½"x1½"
CLEVELAND "C", ½" stroke; Cap. 1½"
CLEVELAND "C", 1⅝" str.; Cap. 1"x1¾"
HILLES & JONES No. 2, 1½" str.; Cap. 1"x1"
HILLES & JONES No. 2, 1½" str.; Cap. 1"x1"
HILLES & JONES No. 3, 2½" str.; Cap. 1"x1"
MASSILLON No. 5, 1½" str.; cap. 1"x1"
MASSILLON No. 5, 2" str.; Cap. 1"x1"
WILLIAMS & WHITE #17 Cap. 1"x1"

PUNCHES—Double head, Open Gap, Vertical
CLEVELAND "C"; str. 1¼"; Cap. ½"x1½"
CLEVELAND "C"; str. 1⅝"; Cap. 13 16"x1¾"
HILLES & JONES No. 3; str. 1⅝"; cap. 1"x1"
HILLES & JONES No. 3; str. 1⅝" cap.; 1"x1"
HILLES & JONES No. 3; str. 2"; cap. 1"x1"
LONG & ALLSTATTER size B; Cap. 2"x11½"

POWER PRESSES
BLISS #410A double crank toggle drawing
BLISS #10A vert.; double crank, 450-tons
TOLEDO #88 single crank; 16" stroke

SHEARS
LONG & ALLSTATTER Type 3 Bolt; str. 1½"
LONG & ALLSTATTER Type B dbl. hd. coping; str. 2½"
LONG & ALLSTATTER Type A dbl grd Gate; str. 4½"
McINTOSH-HEMPHILL single grd Bar; str. 3½"

AXLE LATHES
BRIDGEFORD double end, center drive, 9' centers
NILES double end Burnishing, 9' centers
NILES double head Burnishing, 8'5" centers
NILES double end center drive, 9' centers
NILES double head Finisher, 8'5" centers
NILES double head Rougher, 8'5" centers
PUTNAM double end centerdrive, 9' centers

FORGING HAMMERS—Steam, double frame
CHAMBERSBURG 600#; 6" cyl.; 14" between guides
CHAMBERSBURG 800#; 6" cyl.; 15" between guides
CHAMBERSBURG 1500#; 10¼" cyl.; 20" bet. guides

FORGING HAMMERS—Steam, single frame
ERIE 1100# max stroke 33"; 15⅝" bet. guides
MONIGHAN "American" #610; 27" stroke; 16½" bet. guides

NOTE—There are several miscellaneous items of BORING MILLS, FORGING MACHINES, SAWS, etc. —ask for list

Here is your opportunity to obtain *hard-to-find* HEAVY MACHINERY and SHEET METAL EQUIPMENT at *attractive* prices—INVESTIGATE

McKEES ROCKS INDUSTRIAL ENTERPRISES

Nichol Ave. Phone FEderal 1-0746 McKees Rocks (Pittsburgh), Pa.

MUST MOVE PROMPTLY FROM LOCAL CUSTOMER'S PLANT

BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

GOULD & EBERHARD 36" Gear Cutter M.D.

BROWN & SHARPE #5—48" Gear Cutter, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 30"x64". Quantity of boring bars.

CINCINNATI 60"x48"x14' Planer. 4 heads. 1 extra side head on massive floor stand for open side work. M.D.

B & O #2 Turret Lathe 1" Cap. M.D.

AMERICAN 20"x16' QUICK CHANGE GEAR LATHE. M.D. Old, but good.

BARNES HEAVY DUTY 26", 4-SPINDLE DRILL. 1 spindle for tapping M.D. #4 M.T.

GRINDERS—CYLINDRICAL. B & S #11, 7"x 32". Plain Grinder. Table swivels. Motorized with 4 motors.

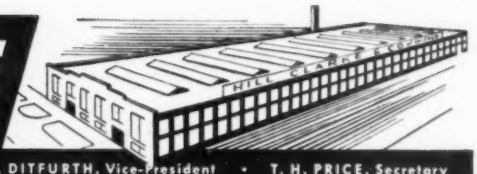
LANDIS 10"x36" Plain, M.D. Also Planer type Grinder 16"x36".

"BEMENT" 26" STROKE TRAVERSING HEAD SHAPER. 48" travel to ram. 2 tables. (PLANER SHAPER)

THE OSBORNE & SEXTON MACHINERY CO.

P. O. Box 88 Columbus 16, Ohio

HILL-CLARKE MACHINERY COMPANY



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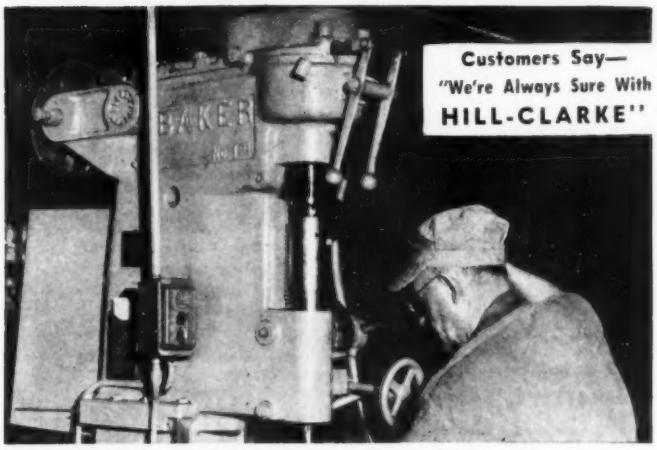

FOR THE 40 YEARS THE OLIVER CORPORATION has purchased Hill-Clarke's machines, they've found thier dependability and long-performance prove their economy over ordinary second-hand machines. Above is one of Oliver's Hill-Clarkes used at their Charles City plant.

AUTOMATICS

⅞" G Model Gridley
1-1/16" Model A Cleveland (1942)
1½" Foote Burt (1941)
1¾" Model G 4 Spdl. Gridley

DRILLS

2 Spdl—24" Sw—No. 2 Aveymatic
6 Spdl—14" Sw—No. 2 LMS L.G. Hyd.
D-31 Fox Multiple Drill

GEAR MACHINES

No. 12 HS Gould & Eberhardt Hobber
No. 12-H Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 1 Whiton Auto. Gear Cutter
No. 6 Gleason Bevel Gear Tester ('42)
No. 36-BM G & E 3 Spdl. Rougher
No. 65 Fellows—Cone Dr.

BORING MACHINES

3" Lucas Hor. Bor. Mill.
Rockford—3⅛" Bar
42" N-B-P Vert. Bor. Mill.
72" Niles—Hvy. Pattern

GRINDERS

4"x18" Landis, Model 4H
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x36" Norton Type C (1943)
10"x72" Landis Type C Hydraulic
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
16"x120" centers
16"-40" gap x 120" centers
18"x96" centers
18"-30" Gap x 96" centers
20"x96" centers
24"-32" Gap x 144" centers
26"x72" Norton Crank Shaft Grinder
15"x15"x8' Norton Surf. Gdr.
No. 25-A Heald Surface Grinder
No. 16-26" Blanchard Surf. Gdr.
5B Bryant Internal
No. 72-A-5 Heald Internal (1942)
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

LATHES

14"x6' Walcott Lathe
19"x8' LeBlond Hvy. Duty Lathe
20"x9' Chard Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
No. 5 B & O Tur. Lathe, Cone Hd.
No. 6 Warner & Swasey Tur.-Bar Fd.
2¼"x24" Jones & Lamson
No. 2A Warner & Swasey s.p.d.
No. 3A Warner & Swasey (1941)
20"x8' Fay and Scott
18" Libby Tur. Lathe, M.D.
21" Gisholt, M.D.

MILLING MACHINES

No. 08 Cincinnati Plain
No. 08 Cincinnati Vert.
No. 3 Sundstrand Rigidmil
6"x36" Lees-Bradner—LT (1943)
6"x80" Pratt & Whitney Thrd. Mill
6"x132" Pratt & Whitney Thrd. Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)
10"x60" Pratt & Whitney Thrd. Mill

MISCELLANEOUS

24" Lutter & Geis Shaper
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
18" Newton Slotter
No. 0 Bakewell Tapper
Baush Radial Tapper
No. 307 Barnes Hone
No. 200 Micromatic Horiz. Hone, 1 Spdl.
No. H-2 Micromatic Horiz. Hone, 2 Spdl.
Model 200—H5 Micro.—Horiz.—2 Spdl.
14' Niles-Bement-Pond Roll
Am. Chip Wringers (New) 3.3 to 12.6 bushel capacity
No. 6 R & K Straight-side Press, M.D.
4-B Marvel Hack Saw
48"14 Ga. Economy Shear, M.D.
No. 5 Reynolds Power Screw Driver
75 Ton Hannifin Hyd. 4 post press

PLANERS

36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati; 2 hds.

FULL MONEY-BACK GUARANTEE

1. Hill-Clarke gives you an unconditional money back guarantee.
2. All machines in stock.
3. You can see your machine run and tested under power in our plant before purchasing.
4. Complete and modern facilities plus experienced craftsmen for RE-MANUFACTURING machine tools in our 58,000 sq. ft. plant.
5. A responsible organization—with eighty-four years experience.

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD, CHICAGO 6, ILL. PHONE CEntral 6-0500

HEADLINERS

GRINDERS

No. 2 CINCINNATI "Filmatic" Centerless, thru-feed, infeed, late. Excellent.

14" PRATT & WHITNEY Model B Vert Spindle Surf.
No. 2 Norton M.D. Tool & Cutter
18"x72" Norton Plain Cylindrical, m.d.
20"x144" Landis Plain Cylindrical, self-cont
No. 49-53 Besly Vert. Spdle Disc, m.d.
No. 510 Oliver Drill Grinder, late

MILLERS

No. 00 Sundstrand Hydraulic "Rigidmil", m.d., late
No. 1-V Kent-Owens Hydraulic, m.d., late
48" Cincinnati Plain Automatic, m.d.
No. 2-M Cincinnati Universal, m.d.
No. 3-A Brown & Sharpe Universal, m.d.
No. 4 Ohio Plain, m.d., vert. hd.
No. 4 Cincinnati High Power Vertical, m.d.
32"x24"x16" Ingersoll Adj. Rail, arr. m.d.

LATHES

25"x150" ctrs LeBlond Heavy Duty 16-speed Grd. Hd., m.d.
24"x60" ctrs American Heavy Pattern 12-speed Grd. Hd., m.d., taper
24"x51" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d., taper
21"x136" ctrs LeBlond Heavy Duty, Turner Drive, taper
20"x96" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d., taper
20"x94" ctrs American Grd. Hd., m.d.
20"x70" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d.
16"x30" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d.
14"x30" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d.
11"x4' LeBlond "Rapid Production" High Speed Grd. Hd., m.d.
No. 608-PV Rivett Precision Toolmaker's, cab. base, quickchange, taper, turret attach., milling attach., 1942.
W. C. Lipe "Carbo-Lathe", m.d., late

MISCELLANEOUS

No. 2-A Warner & Swasey Turret Lathe, m.d., Timken, covered ways
36" Bullard "Rapid Production" VTL, m.d., threading, very clean
No. 236 Gray Nibbler, m.d., 5 16"x36"
3' Fosdick Radial Drill, m.d.
7' Dreses Radial Drill, m.d.

COX MACHINERY COMPANY, INC.

Many other machines in stock. Send for stock list.

3 MINUTES FROM THE CINCINNATI HOTEL DISTRICT

P. O. BOX 1953 CINCINNATI 1; OHIO
Office&Warehouse 311-313 Bakewell St.,Covington,Ky.

BOLT THREADER, 1½" Williams Reliance
BORING MILL, 100" Cinci. Massive, 2 Hds., M.D.
BORING MILL, 72" N.B.P., P.R.T., M.D.
BORING MILLS, 4" bar Landis Floor 4½" bar Niles table, Dual Control, 3" bar Univ.
BORE-HONE, Barnes, 10" stroke, 6" bore, '42
BRASS LATHE, 21" Acme, Late, Hardened Ways
DRILLS, 21" Royersford-Excelsior New & Used
DRILL, 25" Weigel, Tapping, M.D.
DRILL, 6 Spin. Allen, Pw. Fd., No. 2 M.T.
GEAR GENERATOR, 3" Gleason straight, Late
GEAR HOBBER, 36N Gould & Eberhardt
GEAR HOBBER, #12 Barber Colman
GEAR PLANER, "11" Bienecker, Bevel
GEAR SHAPER, No. 75 Fellows High Speed 6IA, 6I, & 64A, 6 Fellows
GRINDERS, 20"x120" Landis, Cyl., Hyd., AC
GRINDER, 16"x48 Cinci., Cyl., M.D.
GRINDER, No. 6-T Sellers, Tool, '42
GRINDER, No. 16Y2B Bryant, Int., 1943
GRINDER, No. 17A Heald Gap, Int. 54" sw., '42
GRINDER, No. 72A3 Heald Internal Pl., '42
GRINDER, No. 72A5 Heald Internal, 1943
GRINDER, Micro-Internal, Large
GRINDER, SURFACE, 14"x36" P. & W.
GRINDER, UNIV. 12"x36" Thompson M.D.
LATHES, 42"x10' cen. Putnam Grd. Hd. M.D.
36"x20' cen. Putnam, 2 Carr. T.A.
32"x25' cen. Pitts. Sommerfeld, 2 carr. T.A., '42
25"x12' cen. LeBlond Grd. Hd., M.D.
25"x12' bed Bridgeford Grd. Hd. (3)
22"x48" cen. Skoda, 24¾" sw. NEW
20"x48" cen. Ameri. 8 sp. T.A. (3)
18"x55" cen. Cinci. 20" sw., 1942
16"x6' & 12'x6' Hendeys Grd. Hd., T.A. (2)
12"x6' bed Reed Prentice, 14½" sw. Grd. Hd.
TURRET LA., No. 3AL Gisholt, 6¼" hole in spin.
26" Libby "C" 4½" capty.
No. 1B Foster Univ., 2" capty. (2)
No. 2B Foster Univ., 3¼" capty. Bar, Timken
THREAD MILLER, 12"x60" Morey Shields, '42
MILLER UNIV., No. 2A Brown & Sharpe
MILLERS, Nos. 2 & 3 Cinci. Plain, Turner M.D.
No. 1½ Cinci. Pl. Lima Dr., Vert. Attach.
MILLERS, HORIZ. No. 4 Cinci. High Power
MILLER, HORIZ. No. 2 Stand. & T., M-in-base
PIPE THREADER, 2" Landis, AC, M.D.
PLANER, 48"x36"x8' Cinci. 4 Hd., Box, PRT, Force Feed
RADIAL DRILL, 7'10" col. Amer. Trip. Purp. M.D.
RADIAL DRILL, 5'13" col. Bickford
RADIAL DRILL, 5' Dresses-Mueller, $975.00
SHAPER, 24" Stockbridge, gear box M.D.
SHAPERS, 24", 20" & 16" G.E., AC, M.D.
22" & 16" Hercules Univ., New
36" Morton, Draw-Cut M.D.
SLOTTERS, 20"—24" & 10"—12" Drills, M.D.

BENNETT MACHINERY CO.
375 Allwood Road, Clifton, N. J.
Off Route 5-3, Phone Prescott 9-8996
New York Phone: LOngacre 3-1222

TURRETS

(2) W & S #2 Chuckers (1942)
(4) W & S #2 Bar Feed (1942) 1" Cap.
(3) Morey #2G Bar & Power to Turret (1941) 1" Cap.
(1) Libby 3R Bar Feed 1¾" (1942).
(1) Foster Univ. 1¾" Bar & Chuck (1930)
(1) Libby Univ. 5" Bar & Chuck (1930)

RADIAL DRILLS

N.B.P. 5'x13" Rd. Col.
Bickford 8' x 15" Rd. Col., with universal arm.

Both older but good condition. Motors thru gear box base.

KINGS COUNTY MACHINERY EXCHANGE
408 Atlantic Ave., Brooklyn, N. Y.
TRiangle 5-5237—Dept. "A"

MACHINERY FOR SALE
ATTENTION EXPORTERS!

Unusual opportunity to procure modern Fellows Gear Shapers 615A and 6IA as well as 12" Gleason Generators, 36 BM Gould & Eberhardt Rougher, 27 Fellows Gear Shaper, #16 D. E. Whitton Machine. Write for full information.

FS-1833, AMERICAN MACHINIST
330 W. 42 St., N. Y. 18, N. Y.

1—Extrusion Press 150 ton. Material cylinder 5"x30". Material pressure 15,500 lbs. per sq. in.
1—Pump oil gear. Type DSG825506. Rate pressure 2500 lbs. per sq. in.
1—Impact tester, Riehle, capacity 110-220 ft lb. with tools for Izod & Charpy tests.
1—Welding, generator—300 amp. Lincoln generator. Chrysler engine.
1—Welding, transformer 500 amp. Westinghouse Model B.
1—Welding, rectifier 75 amp. Allis-Chalmer Weld-O-Tron.
1—Radiograph, Table and torch Airco #4

METAL & THERMIT CORP.
P.O. Box 471 Rahway, N. J.

TOOLING AND LATHE FOR SALE

Surplus Tooling For #3, 4, 5, 1A and 1L Warner & Swasey and Gisholt Turret Lathes. Single & Multiple Roller Turners, Slide Tools, Circular & Dove Tail Form Tool Holders, Necking Tool Blocks, Square Turrets, Master Collets, Collet Pads, 15" Air Cylinder. 1—1" Pratt & Whitney Hand Screw Machine with Motor, Bar Feed & Collets.

Want To Buy 1"-1¼" Multiple Spindle Automatic Screw Machine.

ROBY MACHINE WORKS
TRURO, IOWA

4' JACK KNIFE RADIAL
FOOTE BURK HAMMOND—MODEL G—
6 SPEEDS—LIKE NEW

ILLINOIS MACHINERY CO.
3018 SO. ADAMS ST. PEORIA 2, ILL.

Latest Types — Guaranteed Machine Tools 1941-1951 Models

BROACHING MACHINES

CINCINNATI: 2-36 Vertical Broach, 2 ton, 36" stroke with single broach slide

CAM MILLERS

VAN NORMAN: Contour Miller 10CT, for milling flat cams and similar work

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
ARCHDALE: Radial, all sizes (New)
BARNES: 2011¼ 2-spindle on 3-spindle base
BAKER: 217 Upright Heavy Duty, 2" capacity
FOSDICK: No. 4BM Upright, High Speed, ⅞" drilling capacity, 12" overhang
PROVIDENCE ENG: FV-6 Sensitive 6 motor-driven spindles, ⅜" capacity
PRATT & WHITNEY: 1½B x 50 Deep Hole Reaming Machine

GEAR CUTTING MACHINES

BARBER-COLMAN: No. 3 Hobber
BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 13¾ D.P. capacity
FELLOWS: 61A Shaper, 18" dia. capacity
FELLOWS: 64A Shaper, 18" dia. capacity
FELLOWS: 72 Shaper, 7" dia. capacity
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Generator
GLEASON: 3" Straight Bevel Gear
HAMILTON: No. 1 Hobber, 6" diameter
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 24" long (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x24" Hydr. Spur Gears and Splines, also internal
GLEASON: No. 17 Spiral, Zerol & Hypoid, capacity 23½ P.D.

GEAR FINISHERS & TESTERS

FELLOWS: 8LSI and 18LSI Gear Lappers. External & Internal Spur and Helical
FELLOWS: No. 12-C Spacing Tester
GLEASON: No. 4 and No. 6 Bevel Gear Testers. Hand and Power Operated
GLEASON: 3" Bevel Gear Tester
NATIONAL BROACH: SIC—12" Red Ring Tester

GRINDERS—CYLINDRICAL

BROWN & SHARPE No. 23, capacity 10"x 48", plain
BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI 6"x18" Hydraulic, plain
CINCINNATI, 10"x36" Hydraulic, plain
LANDIS: 18"x32" Type "D" Crankpin, Hydraulic, for grinding crankshafts
NORTON: 6"x18" plain, hydraulic
NORTON: 10"x18" plain, hydraulic
NORTON: 10"x18" 45° angle wheel head
NORTON: Crankshaft Grinder, 23"x72"
VAN NORMAN: #666 Crankshaft Regrinder, 20"x48"

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x24" Hydr. Spur Gears and Splines, also internal
GLEASON No. 17 Spiral, Zerol & Hypoid, capacity 23½ P.D
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: No. 112 with high frequency wheel head, 42000 rpm
BRYANT: No. 5Y Internal
BRYANT: 112 Universal, Hydraulic
BRYANT: 16C16 Hole, Hydraulic
HEALD: 70A Plain, Internal
HEALD: 72A5 Plain & Univ.
HEALD: 72A3 Sizematic Centerless
HEALD: 72A5 T-bed, Universal
LANDIS: Hydraulic, 8" stroke x 15" dia.

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½" diameter
VAN NORMAN: #639, capacity 7" diameter
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Universal, capacity up to 3½" dia.

GRINDERS—SURFACE

ARTER: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

EXCELLO: No. 31 external, dia. 5"x18" centers
JONES & LAMSON: TG-1245 External, 12" dia. x 45" centers, with additional capacity if required

HONING MACHINES

BARNES: No. 306H Vertical, 24" Stroke
MICROMATIC: H-510 Double End Horizontal
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia. capacity

LAPPING MACHINES

FELLOWS: 8LSI and 13LSI Gear Lappers
NORTON: No. 26 Hyprolaps, for flat work & cylindrical lapping
NORTON 2Fx40" dia., for flat work
SCHRANER: Model A External Cylindrical Lapper—4 heads

LATHES—PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48": centers.
LODGE & SHIPLEY: No. 3A Duomatic
MONARCH: 24"x60" Geared Head
MICHIGAN: 1708 Relieving, 8"x24"
MICHIGAN: 1712 Relieving, 12"x32"
PRATT & WHITNEY: 16"x40" Toolroom
WILLSON: 15" x 48" Geared Head Motor Driven (New)

LATHES—TURRET

GISHOLT: #2L Saddle Type
HERBERT: #8 for chuck work, 20" swing (New 4 machines)
HERBERT: Turret Lathes, all sizes (New)
WARNER & SWASEY: 2A, Saddle Type
WEBSTER & BENNETT: Vertical Turret Lathes, 36" and 60" dia. (New)

MILLING MACHINE

BRIDGEPORT: Vertical Miller, power feed
CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
RICE-BARTON: Duplex Spline
SUNDSTRAND: No. 0 Rigidmil
TAYLOR-FENN: M-80 Duplex Spline
TAYLOR-FENN: Vertical 6"x21" table with power feed, high spindle speeds, for toolroom work
VAN NORMAN: Contour Miller 10CT, for milling flat cams and similar work

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
WILLIAMS: 10" Pipe & Tube Cut-Off

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread
LEES-BRADNER: LT 6"x36" Thread
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity
NATCO: Vertical Tapper 16 spindle
PRODUCTO: Hand Tapper

TOOL SHARPENERS

FELLOWS: Flat Top Helical Gear Cutter
OLIVER: 2A Face Miller Grinder
OLIVER: 10" Template Tool Bit Grinder
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing from tooth to tooth

MISCELLANEOUS

CUT-OFF: Campbell, Abrasive 423 Cutalator, 4½" dia. capacity
CUT-OFF: Pipe & Tube, 10" Williams
PRESS: Slrew, Gen. Flex. 3 ton
RIVETER: Gen. Engr. 24" throat
TEST STAND: Denison 918-AM Hydraulic
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
RACK CUTTING MACHINE: Sykes 24" to 36" length capacity (New)
PUNCH SHAPER: Sentinel Shrewbury, Thiel type design (New).

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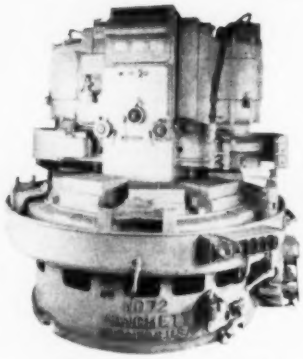
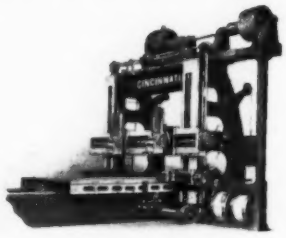


Hanchett No. 72—3 Head Rotary Surface Grinder



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72" x 56" x 32'
4 Head Motor Driven Double Housing

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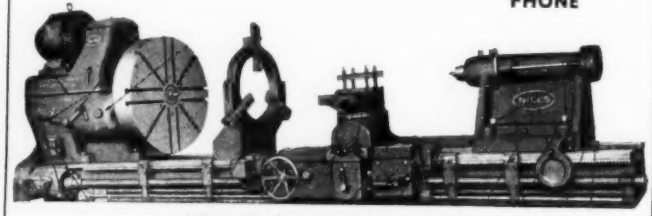

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Motor Driven Heavy Duty Engine Lathe

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No. 2 **SIMMONS** Micro-Speed Turret Lathe, bar feed, 3 jaw chuck, 4 jaw chuck, power feed to turret, tooling, coolant pump, AC motor

56"x18' **CMC** Heavy Duty Lathe, 24 speed geared head, power rapid traverse, 30HP AC motor

100" **SELLERS** Vertical Boring Mill, 2 swivel heads on rail, rapid traverse, 40HP motor drive, rebuilt, excellent

10'-16" **CMC** Heavy Duty Vertical Boring Mill, extension type, 2 swivel heads on cross rail, weight approx. 125,000#

100" **BERTRAM** (Niles Patterns) Vertical Boring Mill, 2 heads on rail, rapid traverse

24' **BULLARD** New Era Type Vertical Turret Lathe, side head, motor drive

No. 1 **DOUGLAS** Plain Horizontal Mill, table 8"x32", power feeds, motor in base, No. 40 taper, new 1942

No. 2D **KEARNEY & TRECKER** Rotary Head Die Miller, cherring attachment, right angle milling attachment, slotting attachment, rotary table, measuring rods, new 1943

No. 2V **REED PRENTICE** High Speed Vertical Mill & Router, new 1942

No. 36 **VAN NORMAN** Ram Type Mill, new 1942

No. 5-48 **CINCINNATI** Duplex Hydromatic Mill, new 1941

No. 10 **BROWN & SHARPE** Tool Grinder, 1943

No. 7125A **FELLOWS** High Speed Gear Shaper, change gears 1943

No. 5 **JOHNSON** O.B.I. Press, new 1944, 55 tons

No. 6 **TOLEDO** O.B.I. Press, 70 tons

25A **HEALD** Rotary Surface Grinder, 24" diameter, magnetic chuck

V-6-24 **COLONIAL** Vertical Broach, 6 ton, 24" stroke, 1947

V-6-36 **COLONIAL** Vertical Broach, 6 ton, 36" stroke

36"x36"x10' **GRAY** Planer, DC reversing drive, box table, rapid traverse

No. 5 **HILLES & JONES** Pyramid Type Plate Bending Rolls, 14" diameter top roll, 12" diameter bottom roll, 10' long, drop end housing, 30 HP slip ring motors

No 60 **NEW BRITAIN** 1"—6 Spindle Automatic Screw Machine, new 1943

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EXCELLENT CONDITION — *Immediate Delivery*

T. G. 6x36 J&L Automatic External Thread Grinder, like new. M. G. Set.

#300 Hanchett Hydraulic Vertical Surface Grinder, mfr. 1943, 11"x34" magnetic chuck.

54" Bullard Vertical Turret Lathe, Serial #14387, spiral drive, 1 turret head, 1 side head, 4 chuck jaws—Excellent Condition—Priced High.

Worthington Horizontal Duplex Air Compressor—mfr. 1942, 125 HP capacity 665 C.F.M., at 100 lb. pressure.

6-42 Bifiss S. S. Double Crank Blanking Press, 126 ton cap.

24" Bullard Vertical Turret Lathe, 1 turret head, 1 side head, New Era type.

3B Abrasive Surface Grinder, 8x24 magnetic chuck, Coolant.

Robot Surface Grinder, 6x18 magnetic chuck.

(2) U.S. #1 Hand Millers—Never used.

(3) #602-K. O. Lee Tool & Cutter Grinders—mfr. 1942, less work heads.

#16 Wallace Tube Bender, Hand Rotary Type.

Type ANO-483-5 Magna Flux Inspection Unit with type SB911 Demagnetizing unit.

(2) Silver Stitchers, like new.

3" Universal Horizontal Boring Mill.

VM-16 Buhr Drilling & Tapping Machine, 48" 6-Station Indexing Table, 36 spindles, like new.

#250C Manville S.S.S.D. Header 4¼" Capacity.

#0 Manville D.S.S.D. Header 3 16" Capacity.

250' Richard Wilcox Zig-Zag Conveyor with drive unit—150 rotating hooks.

350' Monorail Chain type Conveyor with drive unit.

Type C 48"x72" Sly Round Tumbling Barrel, never used.

B-1 Leiman Sandblast unit with Rotary Baskets.

(2) 3 K.V.A. Universal Spot Welders, 220 volt.

(1) 7.5 K.V.A. Universal Spot Welders, 220 volt.

(3) 50 K.V.A. Federal Spot Welders, 440 volt.

(1) 60 K.V.A. Sciaky Spot Welders, 440 volt.

(2) 75 K.V.A. Federal Projection Welders, 440 volt.

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Equipped with 220/3/60 Motors

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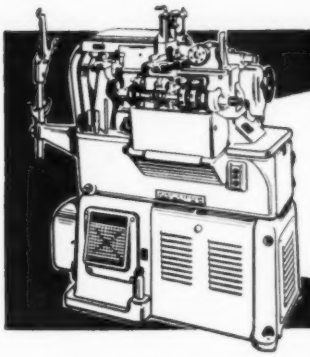

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Beaver-Bilt Brown & Sharpe machines are *unconditionally guaranteed* to produce work to the same tolerances as new machines. Only genuine B & S replacement parts are used and no change is made from standard.

THE FOLLOWING LATE TYPE, HIGH SPEED BROWN & SHARPE AUTOMATIC SCREW MACHINES ARE NOW IN STOCK FOR IMMEDIATE DELIVERY . . .

4—No. 00 H.S. Serial Nos. 13408, 13409, 13883, 13884 (1938): Swing Stop, Vertical Cutoff Slide, ½" Spindle Cap., 6000 R.P.M. Spindle Speed, Countershaft Driven. Beaver-Bilt.

2—No. 00G H.S. Serial No. 15163 and 16851 (1943), Swing Stop, Vertical Cutoff Slide, ½" Spindle Cap., 6000 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.

1—No. 00G H.S. Serial No. 19040 (1946): Swing Stop, Vertical Cutoff Slide, ½" Spindle Cap., 6000 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.

7—No. 00G H.S. Serial Nos. 20,000 plus (1948): Swing Stop, Vertical Cutoff Slide, ½" Spindle Cap., 6000 R.P.M. Spindle Speed, Motor in base. Chain Driven Spindle. Beaver-Bilt.

1—No. 0G H.S. Serial No. 10861 (1943): Swing Stop, Vertical Cutoff Slide ¾" Spindle Cap., 4150 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.

1—No. 2 H.S. Serial No. 7504 (1937): Swing Stop, Vertical Cutoff Slide 1¼" Spindle Cap., 3000 R.P.M. Spindle Speed, New Turner Drive. Beaver-Bilt.

1—No. 2G H.S. Serial No. 9578 (1943): Swing Stop, Vertical Cutoff Slide, 1¼" Spindle Cap., 3000 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.

Each of the above machines is Beaver-Bilt and complete with the following standard equipment—standard capacity Feed Tube—Front and Back Circular Tool Posts—Work Pan—Wrench Rack—Turret Hand Lever—Full set of Feed Change Gears—Full set of Spindle Speed Change Gears—Stock Stands—Complete set of Oil Splash Guards.

TRADE-IN SPECIALS IN GOOD OPERATING CONDITION AT A FRACTION OF ORIGINAL COST

2—No. 00G H.S. B. & S. Automatic Screw Threading Machines Serial Nos. 16024, 16025, with Screw Slotting Attachments and Motors in base. These machines are in excellent operating condition.

5—No. 00 H.S. B. & S. Automatic Screw Machines Serial Nos. 10760, 10762, 10765, 10770 and 10824, complete with Turner Motor Drives. These machines are in excellent operating condition.

2—No. 0 Standard B. & S. Automatic Screw Machines Serial Nos. 2503, and 3344 less countershafts. Good condition.

1—No. 0 Standard B. & S. Automatic Turret Forming Screw Machine Serial No. 5698 complete with Motor Drive. Good condition.

1—No. 0 H.S. B. & S. Automatic Screw Machine Serial No. 8412 with New Drive-All Motor Drive. This machine is in excellent operating condition.

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15—Hardinge Second Operation Machines, Bench Type (less bench) with Hand Lever Opening and Closing Collet Type Bronze Bearing Headstock (less collets) Serial No. 1775, 9 16" Collet Cap. mounted on a 30" length Bed. There are not any cross slides or turret slides with these machines. Also, less any motor drive. Good condition.

Price for Complete Lot $500.00

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Any Beaver-Bilt or "as is" machine sold by us can be operated in your own shop for a period of 30 days and, if found unsatisfactory for any reason whatsoever, may be returned freight prepaid for a full refund of the purchase price.

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BETTS 8' Vertical—table 98" dia.—actual swing 108"—takes 69" under crossrail—2 swivel heads—motor driven
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BROWN & SHARPE #1 Universal, 10"x20" cap. — standard equipment — M.D. — late type
BROWN & SHARPE #2 Universal, 14"x30" cap. large quantity of equipment—M.D.—late type
BROWN & SHARPE #20 Plain Cylindrical, 10"x18" cap.—electrically controlled—M.D.—late type
LANDIS 6"x18" Type "C" Hydraulic Cylindrical, 4-Motor drive—power rapid traverse—late type
FARREL 32"x180 Roll Grinder with crowning attachment

LATHES

NILES 48"x30' ctrs. Heavy Duty Engine Lathe—2 carriages—taper attachment—rapid traverse—motor driven—late type
NILES 60"x26 1/2" Geared Head Engine Lathe—16' ctrs.—motor driven
SENECA FALLS 8"x108" ctrs. Lo-Swing Lathe—swing 13 1/2"—automatic work drive assembly—2 power feed carriages—motor driven
LeBLOND #2 Boring Lathe (1942)—swing 18 1/2"—10' stroke—excellent condition
POTTER & JOHNSTON #6DRE Chucker—swing 34"—Timken bearings—motor driven—tooling

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BROWN & SHARPE #2A Double Overarm Universal—#50 Taper—speeds 21 to 496 RPM—motor-in-base—late type—dividing head—vertical attachment
CINCINNATI #3 High Power Vertical—range 34"x13"x14"—#50 taper—power rapid traverse—late type
CINCINNATI #3S Plain High Power Horizontal—range 34"x12"x20"—table 58 3/4"x13 1/2"—#50 taper—power rapid traverse—motor-in-base
CINCINNATI #2 High Power Vertical—range 28"x12"x14"—table 50"x12"—motor driven

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75 Ton, 60" Stroke, Bed area 20"x 21", Shut Height 18', 150 HP Motor.
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7/8" Gridley Model G.
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1 1/2" Cone 4 spindle
No. 454 New Britain Chucking
14"x19" Fay
14"x18" Monarch Magnamatics

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84" Gisholt
34" King single turret
3" Rockford
4" Detrick & Harvey floor type
No. 5D Moline 6 spdl. cylinder bore

DRILLS

14" Leland Gifford 1, 2 & 4 spdl
14", 4 spdl Buffalo sensitive
15", No. 2 Avey, 1 & 4 spdl., hydr. feed
16" Sipp, 2 spindle
24", No. 4B Edlund, power feed
24" Cincinnati
Nos. 310, 315 Baker
No. 217H Baker horizontal
Barnes horizontal radial
3' Carlton sensitive radial
6'-15" Dreses radial
16 spindle No. 13 Natco multiple
1 & 4 spdl. Avey No. 2, woodpecker feed
7 spdl. Moline horiz. hydr.
12 spdl. Defiance adjustable rail

GEAR CUTTERS

14", No. 5A Lees Bradner hobber
24", No. 3 Adams Farwell hobber
Nos. 8H, 12H, 16NS, 18H G. & E.
No. 130 Cleveland Rigidhobber
No. 5A Lees Bradner hobber
4" Gleason spiral bevel
Gleason testers & lappers
Illinois involute tester
Red Ring shavers, lappers & speeders
24", No. 3 Adams Farwell hobber

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10"x18" Norton, plain & semi-auto.
10"x18" Landis hydraulic
10"x24" & 16"x72" Landis mechanical
10"x18", 10"x30" & 10"x50" Norton mech

GRINDERS, INTERNAL

No. 75A Heald hand feed
Nos. 72A3 & 72A5 Heald
No. 72A3 Heald, cross sliding, head
No. 72A3 Heald Sizematic
Nos. 16-28 16F28 & 24-36 Bryant
Gronby bench type

GRINDERS, SURFACE

Nos. 10 & 16A2 Blanchard rotary
12" & 16", No. 22 Heald rotary
8" Pratt & Whitney rotary (tub)
14"x36" Pratt & Whitney vertical
8"x24", No. 78 Wilmarth & Morman
14"x48", No. 5 Abrasive

MILLERS

No. 2 Cincinnati, horiz. & vertical
12" Cincinnati Plain Mfg.
18" & 24" Cincinnati plain automatic
No. 4-36 Cincinnati Hydromatic
18", 24" Cincinnati duplex
Nos. 1, 2 & 3 Kent Owens hand
No. 1 Kent Owens semi-automatic
20"x84" table Ingersoll vertical
Ingersoll Rise & Fall
6 spindle Moline profiler
24"x18"x14' Ingersol planer
48"x24"x22' Ingersoll planer
30" Newton rotary
30", 42" & 84" Ingersoll rotary
No. CT 36 Less Bradner thread
Nos. 4 & 6 Lees Bradner Univ. thread
4 1/2"x12" & 6"x14" P&W thread

SHAPERS & PLANERS

24" Queen City Shaper
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16" Bement Miles slotter
36"x36"x10' Betts planer
48"x48"x14' Woodward planer

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BORING MILLS

#31 LUCAS Horizontal Boring, Drilling and Milling Machine, 3" bar
#25RT G&L Horizontal Boring, Drilling and Milling Machine
36" and 42" BULLARD Vertical Turret Lathes

LATHES

12"x30" MONARCH Model CK Toolroom
20"x8' AMERICAN Geared Head Lathe

AUTO. LATHES & TURRETS

#5 B&O Ram Type Univ. Turret Lathe, pre-selector head
#5DE POTTER & JOHNSTON Aut. Turret Lathe
#6S POTTER & JOHNSTON Aut. Turret Lathe

MILLING MACHINES

#2HL K&T Plain Miller
#1M CINCINNATI Vertical Miller, 1941
#26 VAN NORMAN Ram Type Universal Miller
36"x36"x16" INGERSOLL Adjustable Rail Planer Type Miller, 40 HP AC motor drive, one rail head, two side heads
#08 CINCINNATI Plain & Vert. Aut. Millers

GRINDERS

6"x18" LANDIS Type C Plain Grinder
10"x18" LANDIS Type C Plain Grinder
6"x18" NORTON Vert. Spindle Surface Grinder
10"x72" LANDIS Type C, Hyd. Pl. Grinder, 1942
16"x96" LANDIS Type B Pl. Cyl. with Gap Bed
#16/28 BRYANT Hyd. Internal Grinder
#174 HEALD Hyd. Gap Internal Grinder
#2 CINCINNATI Univ. Cutter and Tool Grinder
#73 HEALD Internal Centerless Grinder
#TG-185 JONES & LAMSON Internal Thread Grinder, new

DRILLS

#2LMS LELAND GIFFORD 2-spindle on 4-spindle base
#3MS LELAND GIFFORD 2-spindle, hyd. fd.
#425 BAKER B.S. Heavy Duty Drill
3'9" CARLTON Radial Drill, 1941

GEAR EQUIPMENT

#725A FELLOWS High Speed Gear Shaper
#36BM GOULD & EBERHARDT Gear Rougher
#12 FELLOWS Gear Shaver

MISCELLANEOUS

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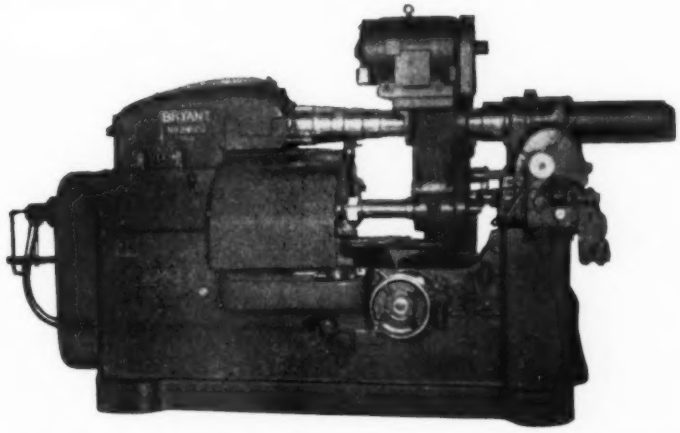

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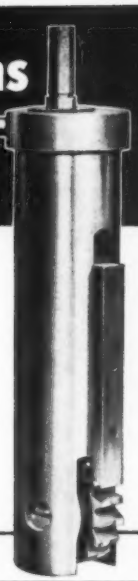

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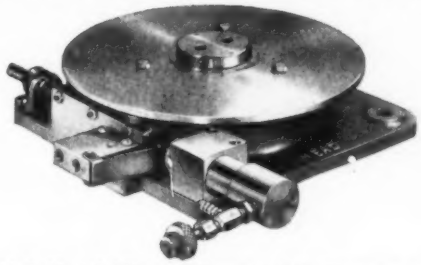

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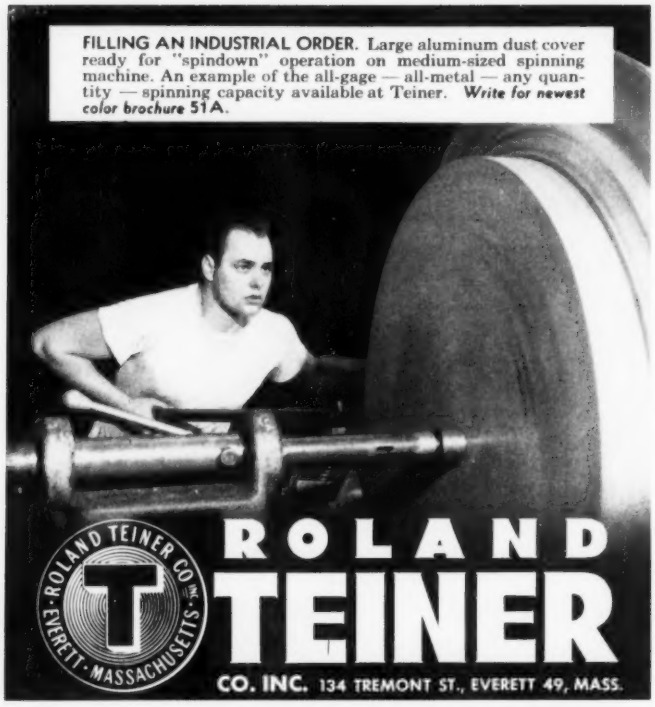

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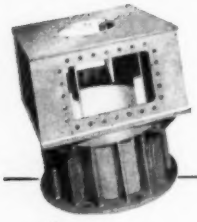

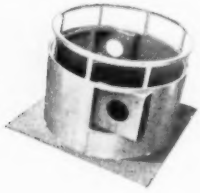

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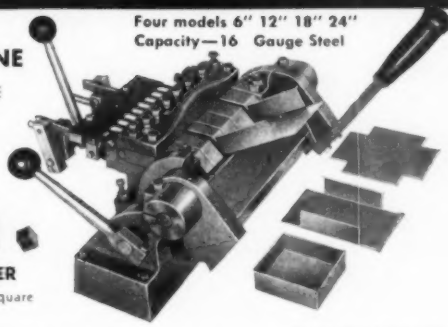
New! di-acro BOX FINGER BRAKE

Four models 6" 12" 18" 24"
Capacity—16 Gauge Steel

3 TOOLS IN ONE

1. BOX and PAN BRAKE
2. STANDARD BRAKE
3. BAR FOLDER



OPEN END FINGER
for forming triangular, square and rectangular tubes.

Versatility from the word GO!! One box or 10,000—can be economically produced with the new Di-Acro Box Finger Brake. The complete box finger bar also serves perfectly for all standard brake operations. An Acute Angle Bar—quickly mounted—converts the brake to a bar folder for locks, seams, hems and sharp angles. The unique Di-Acro Open End Finger forms square or triangular tubes and other similar parts difficult to make. Real machine tool construction, with hardened and precision ground box fingers, assures permanent accuracy in producing duplicated parts. The Box Finger Bar can be easily mounted on all standard Di-Acro Brakes.

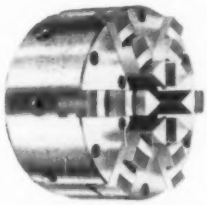
Send for
40 PAGE CATALOG
describing DI-ACRO Shears, Punches, Benders, Brakes, Notchers and Rod Parters,—also Power Shears and Benders.

Di-Acro is pronounced "DIE-ACK-RO"

DI-ACRO PRECISION MACHINES "THE LESS DUPLICATING"

O'NEIL-IRWIN MFG. CO.
311 EIGHTH AVENUE, LAKE CITY, MINN.

Buck AJUST-TRU CHUCKS



NOTHING LIKE IT!

This is the first and only successful dual control chuck. Its operation is easy to understand and use. One pinion (see center of chuck body above) moves jaws in or out to grip work—just like any scroll chuck. 4 opposed screws (only two can be seen in photo) work on the chuck adapter to bring work to dead center. Even dubs have centered work within .0005 in 3 minutes! Once set dead true, hundreds of duplicate parts can be machined without changing adjustment—by simply using the scroll control.

.0005 PRECISION
In 1 MINUTE

Fastest chuck in the world!

Saves fooling around adjusting the grip of four jaws . . . cellophane shims . . . "springing". Keeps the same .0005 precision chucking duplicate parts *with scroll chuck speed.*

6" 6-jaw Buck *handles the work of 93 collets* —yet it's priced in line with ordinary chucks!

Those are just some of the features of this new kind of chuck. They are unbelievable—but TRUE! Send for literature—see for yourself!

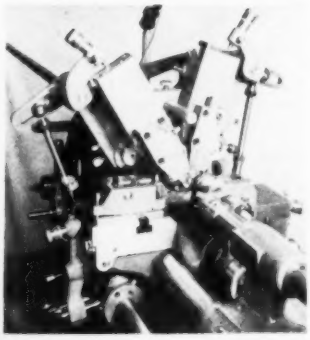
BUCK TOOL CO.
1010 Schippers Lane
Kalamazoo, Mich.

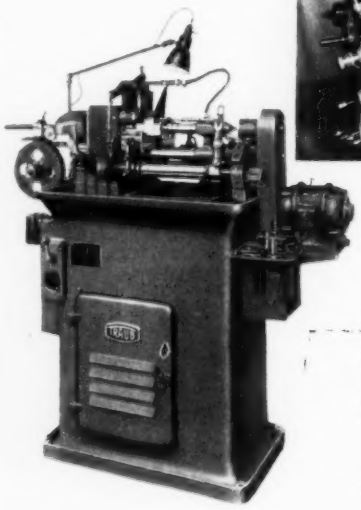
TRAUB

modern, versatile, high-speed

AUTOMATICS

. . . for High Precision Production . . . whether a hundred or a hundred thousand pieces . . .





Extremely rigid and accurate . . . easily set up . . . quick tool changes for 100 or 100,000 pieces. Spare parts and cam blanks carried in stock . . . form tool and cam-making service available.

Prices from **$2475** *. . . financing available*

Model No.	A-15	A-20	A-25	A-36
Brown & Sharpe Spindle Collet	B&S #10	B&S #11	B&S #21	B&S #22 C
Max. Collet Capacity	19/32"	13/16"	1"	1-13/32"
Max. Longitudinal Turning Length	3 1/8"	3 1/8"	3 1/8"	3-5/32"
Max. Threading Length	1 1/2"	1 1/2"	1 1/2"	
12 Spindle Speeds	900/6500	550/4000	550/4000	200/2500
Production Rates Pieces per Hour	28/3000 in 44 steps	28/3000 in 44 steps	28/3000 in 44 steps	15/1300 in 44 steps

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successor to E. R. Bachmann Corporation

130 West 42nd St. New York 18, N. Y.

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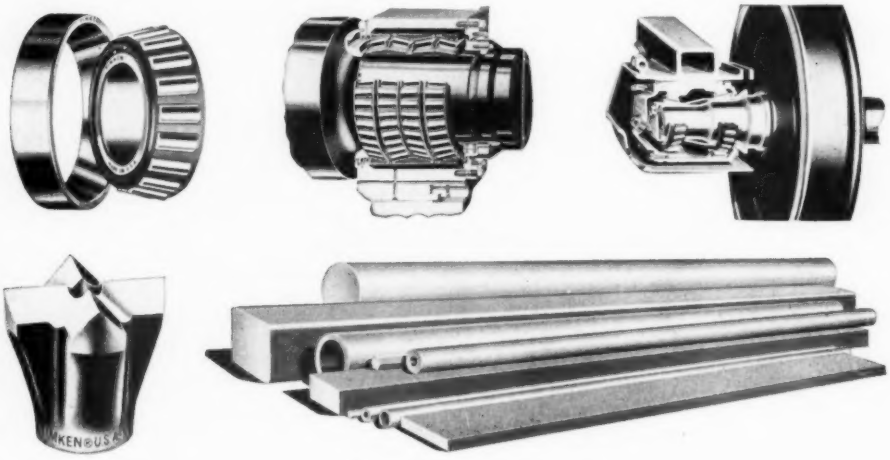

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